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MONTEREY, CALIFORNIA

THESIS

ACTIVITY-BASED COSTING IN THE SYSTEMS MANAGEMENT DEPARTMENT

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December 1995

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ACTIVITY-BASED COSTING IN THE SYSTEMS MANAGEMENT DEPARTMENT

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Submitted in partial fulfillment of the

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This thesis develops a computerized activity-based costing model for the Systems Management Department at the Naval Postgraduate School. The purpose of the activity-based costing model is to provide school and Systems Management Department managers a more useful means of evaluating the cost effectiveness of the Systems Management Department's various programs and activities. Three System Management Department outputs, and the activities and processes required to produce these outputs were identified, analyzed, and documented in the computer model. The activities identified were: classroom education, thesis advising, and reimbursable projects.

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I. INTRODUCTION

A. OBJECTIVE

This thesis demonstrates the applicability of Activity Based Costing to the Systems Management Department at the Naval Postgraduate School. The primary goal of the research was to develop a computer based unit costing model of the major activities and outputs produced by the Systems Management Department. The model was designed primarily for use by Postgraduate School management to facilitate the analysis of cost flows and thus enhance decision making ability.

B. BACKGROUND

The mission of the Naval Postgraduate School as reflected by its mission statement is:

> to enhance the security of the United States of America through graduate and professional education programs focusing on the unique needs of the military officer. These programs are sustained by research and advanced studies directed towards the needs of the Navy and the Department of Defense. Our goals are to increase the combat effectiveness of the armed forces of the United States and its allies, and to contribute to the fundamental scientific, engineering, policy and operational advances that support the Navy, the Department of Defense, and other national security establishments. (NPS Mission Statement, 1995.)

The Naval Postgraduate School's mission is further clarified by Secretary of the Navy Instruction (SECNAVINST) 1524.2A dated 27 March 1989:

> The Naval Postgraduate School exists for the sole purpose of increasing the combat effectiveness of

> the Navy and Marine Corps. It accomplishes this by providing post-baccalaureate degree and non-degree programs in a variety of subspecialty areas not available through other educational institutions. NPS also provides the Department of the Navy through the continuing programs of naval and maritime research and through the maintenance of an expert faculty capable of working in, or as advisors to, operational commands, laboratories, systems commands, and headquarters activities of the Navy and Marine Corps.

The Naval Postgraduate School provides post baccalaureate education in 42 curricula to approximately 2400 officers of the United States Armed Forces and Department of Defense civilian employees annually. Additionally, officers from many nations which are diplomatically and militarily allied with the United States receive graduate and professional education.

The Systems Management Department is the largest academic department within the Naval Postgraduate School. The Systems Management Department faculty consists of 74 members of which 55 hold doctoral degrees. Programs are offered in fourteen different curricula to over 500 students. Students successfully completing the prescribed course study are awarded a Master of Science in Management, Information Technology Management, or International Resource Planning and Management. The Systems Management Department also offers a doctoral studies program in Systems Management.

The normal course of study for degree candidates in the System Management Department is six to eight 12 week quarters consisting of a minimum of 48 hours of graduate level

courses. Degree candidates are also required to conduct independent research and complete a thesis. In addition to conducting classes, the faculty advise degree candidates on thesis topics, conduct research for the Naval Postgraduate School, other federal government agencies, and non-governmental agencies as well as develop programs and teach classes on a contracted reimbursable basis for a variety of Department of Defense and other governmental agencies.

C. PRIMARY RESEARCH QUESTION

The primary research question addressed in this thesis is the identification of the major activities and the associated cost flows of the Systems Management Department to include direct education costs, research costs, administration and overhead costs. Once these activities and cost flows were identified, a software-based model was developed to assist school management in analyzing the cost flows.

D. SCOPE AND LIMITATIONS

This thesis has attempted to identify all relevant activities and related cost flows, while developing a software based model using Sapling's NetProphet® II. Due to the sensitive nature of salary levels, estimated salary costs were made for each class of faculty and staff. This does not effect the accuracy of the cost flows but does change the accuracy of total costs reflected in the model.

Due to staff time constraints, a survey completed in February 1995, detailing estimated time percentages that each Systems Management Department staff member devoted to direct education support and support of faculty research was substituted for current information. It is believed that this survey closely approximates the actual division of the staff members productive workday. Although each staff member performs dozens of activities each day, the level of detail represented by the substitute survey is sufficient for this thesis.

The diverse nature of the Naval Postgraduate School as a provider of professional education, research laboratory, and military base increases the difficulty of accurately separating overhead functions between the various roles of the school. A categorization of school administration and overhead costs to either instruction, research, or military support was accomplished by billet. However, these billets represent considerable monetary resources and should be individually analyzed for a more detailed assignment of costs to activities. Additionally, as maintenance and utility costs are kept only for the base and not for individual structures, estimates of these costs were made based on the square footage of individual buildings using an engineering study completed in February 1991. As some buildings include a combination of offices, classrooms and laboratories, the

utility and maintenance cost allocations are only approximations of actual costs.

Development of activity based costing models to coincide with the implementation of total quality management/leadership (TQM/TQL) has recently been touted in literature as a major step towards solving control problems. While the Department of the Navy has been directed to implement the use of total quality leadership for use in assessing and improving processes at all Navy organizations, the implementation of activity-based costing in the Navy has lagged behind the introduction of TQL. Brimson (1991) maintains that TQM and activity-based costing are extremely compatible in achieving improved performance and reduced costs:

> Total quality management(TQM) means perfect quality in products and services. It emphasizes the importance of quality in every aspect of operations. TQM has two objectives-to make things right the first time and to work for continuous improvement. TQM emphasizes the need to treat all manufacturing functions as processes and strive to improve them. The traditional product cost model-which separately collects labor, material, and cost by product, rather than process-is not compatible with the TQM philosophy; the effect of a process change on a product cost cannot be easily determined. Activities are processes and are therefore compatible with TQM. (Brimson, 1991)

However, for either TQM or activity-based costing to identify areas of performance which can be improved, detailed factual information concerning activities and costs must be provided. Without this information, the activity-

based costing models represent only an approximation of costs associated with activities or outputs and should not be used for decision making until completely accurate cost information, including salaries, are loaded into the model.

The major cost drivers of the Systems Management Department are individuals performing non-routine activities. For example, the activities required to conduct a section of a course will vary depending on the course level, the number of students registered for the course, the frequency which the faculty member conducts a course, as well as the educational and professional backgrounds of the individual students. These factors, as well as the personal preferences of the faculty member impact the level of instruction support required of the staff. This support may take the form of duplication, production of instructional aids, or word processing. Hence, each job action has the potential to be unique. Similarly the Systems Management Department's other major outputs (theses advising, research and course development) are influenced by the students', the researchers' and the staff's individual abilities and educational and professional backgrounds.

E. ORGANIZATION OF THE STUDY

This thesis has five chapters. Chapter I states the objectives of the thesis and discusses the background of the Naval Postgraduate School. It also contains a discussion of

the research questions, scope and limitations of the thesis. Chapter II provides an overview of the Systems Management Department and the school's operating budget. Chapter III contains an overview of the activity-based costing model. Chapter IV provides detailed analysis of three sections of the activity based costing model for the Systems Management Department. Chapter V details the findings of the study, a conclusion and recommendations for further study.

II. THE SYSTEMS MANAGEMENT DEPARTMENT AND THE SCHOOL'S OPERATING BUDGET

A. OVERVIEW

The Systems Management Department is the largest academic department at the Naval Postgraduate School both in terms of the number of students and the number of faculty members. The Systems Management Department was originally established as the Administrative Sciences Department after being separated from the Operations Analysis and Administrative Sciences Department. In 1994, the Information Technology Management Curriculum was transferred from the Combat Systems Sciences and Technologies Department to the Administrative Sciences Department which was renamed the Systems Management Department.

During Academic Year 1994 (AY 1994), 27 September 1993-26 September 1994, an average of 541 students were assigned to the Systems Management Department. The number of students assigned during the academic year ranged from a low of 495 during the spring quarter (28 March-17 June) to a high of 578 students during Summer Quarter (5 July-26 September). Post-baccalaureate degrees were awarded to 279 Systems Management Department students in AY 1994. A breakdown of the number of students and graduates by curriculum in the Systems Management Department for AY 1994 is provided in Table 1.

Curriculum Number and Title	Average Length in Quarters	Average Number of Students	Number of Graduates
Information Technology Management	8	185	78
813 Transportation Logistics Management	7	8	6
814 Transportation Management	7	15	5
815 Acquisition and Contract Management	6	45	36
816 System Acquisition Management	7/8*	63	21
817 Systems Management	6	28	19
819 Systems Inventory Management	6	8	4
820 Resource Planning and Management for International Defense	6	25	17
827 Material Logistics Support Management	6	50	29
837 Financial Management	6	69	43
847 Manpower, Personnel and Training Analysis	7	46	21

* U.S. Army Students standard curriculum is 8 quarters.

Table 1. Department Curricula Data for Academic Year 1994

The actual number of Navy students assigned to each curriculum is determined by Bureau of Naval Personnel using a computer program, the Navy Quota Plan. This computer model uses complex formulas to determine the number of accessions that are required to enter each curriculum to meet the Navy's future personnel needs. (Calhoon, 1995) These quotas are determined for five future years and provided to the school for budgetary purposes. The Navy officer quotas are filled

annually by military assignment officers. Students are assigned to study a specific curriculum based on needs of the military service, the student's personal preferences, and the student's academic profile code (APC). Students are assigned to the school for only the minimum number of quarters required to complete the course of study for the particular curriculum assigned. Generally, the student's assignment to the school is not extended. Follow on assignments, professional training, and personnel rotation dates for the students are coordinated military wide with the graduation dates from the school.

The Systems Management Department's faculty produces three major products: graduate education, thesis advising, and independent research. Conducting NPS courses and advising degree candidates on research and thesis topics are considered to be "direct teaching". On days in which a faculty member is engaged in direct teaching activities, he or she receives remuneration from funds allocated to the School under the Operations and Maintenance, Navy appropriation for officer education. During AY 1994, the Systems Management Department was allocated $4,462,656 for direct teaching. When this figure is accelerated for faculty benefits, the faculty labor costs for direct teaching is $6,470,850 for approximately 60 percent of the total expenditures of the Systems Management Department.

In addition to conducting direct teaching activities, most tenure-track faculty members participate in individual research projects. Research projects may be funded by other governmental agencies, private organizations or by the school. During AY 1994, over $4,459,000 was available to the Systems Management Department to fund salaries, equipment procurement, and travel in support of 60 reimbursable research projects.

Actual reimbursable research expenditures during AY 1994 were $1,926,326 for labor, $822,189 for equipment and $300,618 for travel costs for 50 research projects of which 48 were funded by Department of Defense (DOD) activities. The remaining reimbursable research projects were funded by the U.S. Coast Guard. Of the available research funds, $1,144,973 was carried forward for use in future academic years, while $264,894 was returned to the provider or allowed to expire. Approximately 40 percent of all reimbursable research funds expended by the Department during AY 1994 were in support of two projects, course development for the Defense Acquisition University (DAU) and the U.S. Navy Bureau of Medicine and Surgery (BUMED) executive management education program. Each of these projects was cooperatively developed by faculty groups of ten to twenty members.

B. ORGANIZATION

The organization and administration of the Naval Postgraduate School follows the norms established for

civilian institutions of higher learning, adapted to meet the special needs of the Department of the Navy. The school is headed by the Superintendent, a Navy rear admiral, upper-half, who has command responsibility for the school's education mission, the operation of the physical plant and the unique functions associated with the school campus serving as an active military base. The Superintendent is assisted by the Provost who is responsible to the Superintendent for all academic and education matters. The organization of the school diverges into military and faculty/academic chains of command at the Superintendent level.

1. Academic Chain of Command

All academic programs are administered by the Assistant Provost for Instruction, who is assisted by three division deans. The three divisions are: Engineering and Computational Sciences, Management and Security Studies, and Operational and Applied Sciences. The Systems Management Department is within the division lead by the Dean of Management and Security Studies. Each division dean is responsible for academic, as well as budgetary concerns, within his or her division (Burke, 1995). The Systems Management Department is headed by a chair, who is responsible for the administration of the academic, the research, and the professional education functions of the

Systems Management Department as well as budget administration.

The chair is assisted by Associate Chairs of Research, Systems Development and Instruction. The Associate Chair of Instruction coordinates course offerings and faculty assignments (Thomas, 1995). The Associate Chair of Systems Development describes his duties as coordinating the implementation of technology in department courses. He also coordinates the procurement of computers and multi-media systems on a department wide basis (Liao, 1995). The Associate Chair of Research coordinates liaison with outside organizations concerning reimbursable activities and approves all faculty proposal for research (Eitelberg, 1995).

The faculty of the Department is organized into groups by academic specialty. These faculty academic groups are listed from largest to smallest: Information Technology Management, Financial Management, Manpower and Economics, Acquisition and Contract Management, Management, and Logistics. Faculty from these academic groups offer the courses required to complete the curriculum.

According to the Assistant Chair for Instruction, course offerings for the curricula requirements are determined primarily by the assignment of students are assigned to the school. Scheduling for graduate level classes are then determined by when the course occurs in the program for the students. For example, Financial Management Curriculum

students begin studies only in January and July. Therefore, all required classes for Financial Management are offered twice annually. The school resolves course scheduling conflicts by offering additional sections of requirements or by changing the time or days that a section meets, thus ensuring that the student has the opportunity to complete all degree requirements without extending the student's assignment at the school. Decisions concerning the scheduling of elective classes and faculty teaching assignments are made by the faculty in each academic group. (Thomas, 1995)

Also under the supervision of the Department Chair are 24 of the 30 non-faculty support staff. The support staff functions include instruction and research support, data entry, making travel arrangements for faculty and students conducting either official government business or research, and procurement contracting in support of research or instruction. The aggregate cost of the support staff is approximately $681,000 or approximately five percent of the direct costs of the Systems Management Department.

2. Military Chain of Command

Military personnel and students assigned to the school are under the administration of the Dean of Students and Programs. This position is usually held by a Navy captain, who is assisted by a Navy commander. The Dean of Students is responsible for the military administration of the school,

including the administration of all military personnel programs. The U. S. Marine Corps and the U. S. Army have each assigned a lieutenant colonel to the school to administer Marine Corps and Army specific personnel programs which affect students from these services. Additionally, a Navy commander is assigned to each academic department as a department curricular officer to assist the Dean of Students and administer Navy specific personnel programs.

The Systems Management Department Curricular Officer is a Navy Supply Corps Commander. He is assisted by two Navy unrestricted line lieutenants, an educational technician, and a secretary. The Systems Management Departmental curricular office's primary functions are:

1. Academic counseling and military supervision of officer students,
2. Curriculum development and management to ensure attainment of professional and academic objectives.
3. Liaison with curriculum sponsor representatives.

The majority of the curricular office staff's workday is spent on student support and administration (Munoz, 1995). The assistant curricular officer estimated that ninety percent of the available workday is spent delivering information to the students from the Dean of Students and Programs Office, Personnel Support Detachment and the Registrar (Munoz, 1995). The curricular office is also responsible for the preparation of personnel record documents, such as student officer's fitness reports and recommendations for redesignation.

The administrative workload of the curricular offices are cyclical following specific reporting requirements based on the week of the academic quarter. For example, proposed student schedules for the winter academic quarter are due to the Registrar the eleventh week of summer quarter. Review of student records to validate fulfillment of graduation requirements are due the tenth week of the quarter prior to the student's scheduled graduation. Curriculum review with the various curriculum sponsors is primarily completed during coordinated biannual visits to the school by the sponsors for this express purpose.

In addition to those activities normally associated with supervision of military personnel, the curricular office is also responsible for the "sponsorship" function of new students. This entails acquainting new students with School policies and problem solving normally associated with student relocation. For international students, the curriculum office also provides assistance in locating housing, transportation, acquainting the international student to an American military academic program as well as adjusting to American society. Currently 33 international students are assigned to the Systems Management Curriculum.

C. THE SCHOOL'S OPERATING BUDGET

The annual allotment or operating budget (OB) allocation received from the major claimant contains "ceilings" or controls that limit the total amount of funds which can be

which can be spent on a particular budget line item. These controls are usually drawn from the legislation enacting the annual appropriation although the restrictions may be imposed at the direction of the major claimant. The ceiling that is most relevant to the school is the control established for funds expended on labor (Jay, 1995). Approximately 73 percent of the school's operating budget is allocated to meet labor costs. Aggregate labor costs are controlled both by absolute dollar amounts and by the use of full time equivalent control figures. (Kalmar, 1994) Under the Fiscal Year 1996 Department of Defense appropriation legislation pending before Congress, the use of FTE's would be eliminated and labor costs would be controlled strictly by dollar amounts (Jay, 1995).

During Fiscal Year 1994, the school received operating funds of $56.216 million, of which approximately $41.04 million was allocated for labor costs which was apportioned by the Comptroller between the academic and the operational functions of the school. The Academic Planning Office distributes labor funds designated for the school's mission or academic function to department chairs based on department budget requests submitted annually in early September (Jensen, 1995). In addition to funding the faculty's direct teaching activities, this distribution also provides funding for those functions of the staff which are not in support of reimbursable research. Of the remaining $15 million balance

of the OPTAR allocation, $6.6 million was expended on direct funded research. Other expenditures totaling $7.5 million were: maintenance and preservation of the physical plant ($1.8 million), utilities ($1.7 million), library services ($1.1 million), long distance telephone charges ($850,000), the Church Computer Center ($700,000), printing ($400,000), janitorial contracts ($400,000), copier rental and paper ($250,000), and postal fees ($170,000). (Jay, 1995) These expenditures were for services which benefited all departments of the school, but for which none of the departments was charged or held accountable for cost containment. These services are referred to in the thesis as "centrally funded services." In addition to the $7.5 million for the centrally funded services, an additional $900,000 was expended on consumables, minor operating expenses and official price adjustments. The Systems Management Department's portion of this $900,000 was $40,000 (Jay, 1995).

III. THE ACTIVITY-BASED COSTING MODEL

This chapter details the activity-based costing model developed to analyze the Systems Management Department, using Sapling Corporation's NetProphet® II software. The initial step in building this model was the identification of outputs or products produced by the Systems Management Department. Each output is ideally defined such that it is simple to measure the number of units produced. Once the outputs and units of measure have been established, the activities required to produce a single unit of each output must be established. This is accomplished by analyzing each output and examining the processes and subsystems required to produce a single unit of a particular output. After the activities required to produce the output are identified, the resources consumed in the accomplishment of the process or processes are identified and measured (Brimson, 1991).

For example, the Systems Management Department provides graduate education to students in the Financial Management Curriculum. Education as an output is difficult to measure, but the number of Financial Management Curriculum (837) students who were enrolled in Systems Management Department courses is easily defined and quantified. For modeling purposes, providing education to 837 students was operationalized as students enrolled in required and elective courses. In this example, 837 students are outputs and the courses offered by the Systems Management Department are

activities. The primary resources consumed by conducting a course section is faculty and staff labor. Hence, it is possible to closely approximate the actual cost of labor to conduct one section of a particular course. Other resources that are consumed in the education process, such as copier costs, utilities, and maintenance of the grounds are relatively minor compared to faculty labor and cannot be traced to specific classes given the current accounting systems at NPS.

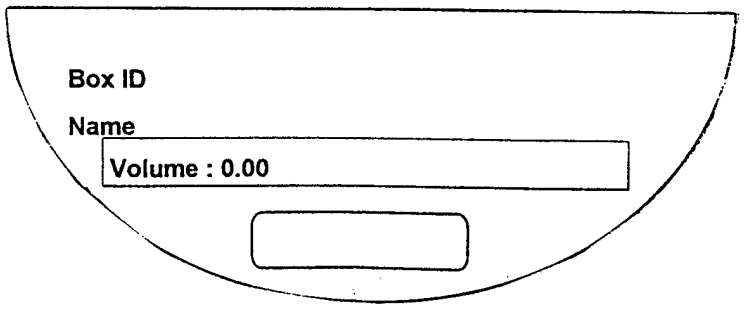
To establish the costs for any particular course section attributable to a specific curriculum, it was necessary to manually determine the number of students from each curriculum in the school who were enrolled in a course during AY 1994. Once this was accomplished, the cost of a course section was apportioned on percentages of students enrolled in the course from each curriculum. For example, if a total of 30 students were enrolled in a MN4161 course, and 15 of these students were 837 students, then 50 percent of all costs to conduct the MN4161 course section would be drawn by the Financial Management curriculum.

This model was developed from a bottom up approach by first identifying outputs, then the activities required to produce the output, and finally the resources consumed in the process of creating an output. Below is a general description of the following sections of the model:

1. Outputs (Classroom Education, The Number of Thesis Advised, and Reimbursable Projects).
2. Summary Boxes.
3. Process Boxes.
4. Route Boxes.

A. OUTPUTS

An output for this model is defined as a measurable product of the Systems Management Department faculty and/or staff. Outputs or demands are represented schematically in the model with the following symbol:



Three major categories of Department outputs were identified:

1. Classroom education.
2. Number of theses advised.
3. Reimbursable projects.

A fourth type of output represents the activities of the other departments in the school and collects these departments' share of the total costs of such services as the Dudley Knox Library, the Church Computer Center, and school administration. Because only the total costs of these

services are known, for modeling purposes, this additional output is required to draw the proportion of the costs of these services which is not drawn by the Systems Management Department. This output is abbreviated in the model as "OTH." The three primary categories of demands are discussed below.

1. Classroom Education

Classroom education for this model is defined as a student enrolled in a NPS course section. In addition to Systems Management Department students enrolled in courses offered by the Systems Management Department, students from eight other academic departments as well as staff members of the school and other DOD agencies attended courses conducted by the Systems Management Department. Over 800 students attended courses offered by the Systems Management Department in Academic Year 1994. It is impractical to attempt to establish the individual cost of providing education to each student. Therefore, Systems Management Department students were grouped by academic major, and all other students are grouped by the academic department to which they were assigned. This categorization closely approximates the unit cost of providing instruction to students by curriculum and estimates the value of the subsidization provided by the Systems Management Department to students in other academic departments and the value of subsidization received by Systems Management Department students from other academic

departments. Table 2 provides a listing of Systems Management Department curricula, the three or four character curricular abbreviation labels used in the model, a listing of summary boxes connected to each output, and the average number of students in each curriculum during AY 1994. Table 3 provides a listing of academic departments other than Systems Management, whose students attended Systems Management Department courses, the abbreviation used to represent these departments in the model, a listing of summary boxes connected to each output, and the total number of students from other academic departments who were enrolled in a course in the Systems Management Department.

2. Number of Thesis Advised

All of the curricula at the school require that every degree candidate complete a thesis as one of the requirements for earning a graduate degree. One of the requirements of thesis completion is for the student to arrange for a faculty member to act as a thesis advisor. Generally, students are advised by two faculty members, a principle and an associate thesis advisor. Thesis advising is considered a direct teaching activity, and faculty members may substitute thesis advising for course instruction to achieve required student contact hours. At the school, a faculty member acting as the primary thesis advisor on a single thesis is comparable to the faculty member conducting a one credit course, while the associate advisor is given credit for conducting a

CURRICULUM	ABBREVIATION	SUMMARY BOXES*	AVERAGE NUMBER OF STUDENTS**
INFORMATION TECHNOLOGY MANAGEMENT	370	370A-370H	185
TRANSPORTATION LOGISTICS MANAGEMENT	813	813A-813K	8
TRANSPORTATION MANAGEMENT	814	814A-814K	15
ACQUISITION AND CONTRACT MANAGEMENT	815	815A-815K	45
SYSTEM ACQUISITION MANAGEMENT	816	816A-816K	63
SYSTEMS MANAGEMENT	817	817A-817K	28
SYSTEMS INVENTORY MANAGEMENT	819	819A-819K	8
RESOURCE PLANNING AND MANAGEMENT FOR INTERNATIONAL DEFENSE	820	820A-820K	25
MATERIAL LOGISTICS SUPPORT MANAGEMENT	827	827A-827K	50
FINANCIAL MANAGEMENT	837	837A-837K	69
MANPOWER, PERSONNEL AND TRAINING ANALYSIS	847	847A-847K	46

*Inclusive
**Derived from records provided by NPS Registrar

Table 2. Systems Management Department Output Model Data

one-half credit course for a completed thesis. (Thomas, 1995) If two faculty members act as co-advisors, each faculty member is awarded the equivalent credit of conducting a .75 credit hour course. It is for this reason, that the number of thesis advised output is separated from the education output. Systems Management Department faculty advised a total of 384 students in AY 1994. Each category of thesis advising is tracked separately: The four letter

ACADEMIC DEPARTMENT	ABBREVIATION	SUMMARY BOXES*	TOTAL NUMBER OF STUDENTS**
AERONAUTICAL ENGINEERING	DAA	EAAA-EAAB	52
JOINT COMMAND; CONTROL, AND COMMUNICATIONS	DCCC	ECCA	62
ELECTRONICS AND COMPUTER PROGRAMS	DEE	EEEA-EEED	67
MECHANICAL ENGINEERING	DME	EMEA	10
NATIONAL SECURITY AFFAIRS PROGRAMS	DNSA	ENSA	14
OPERATIONS ANALYSIS	DOA	EOAA-EOAB	154
UNDERSEA WARFARE, SPACE SYSTEMS, AND ELECTRONIC WARFARE PROGRAMS	DUSS	EUSA-EUSB	69
NPS STAFF	DSTA	ESTA-ESTB	21

*Inclusive
**Derived from records provided by NPS Registrar

Table 3. Non-Systems Management Department Model Data

identification label used for the primary theses advising box is THEP. The four letter identification label for co-advising a thesis box is THEC. The four letter identification label for the associate thesis advisor box is THEA.

3. Reimbursable Projects

The Systems Management Department faculty engaged in 50 reimbursable projects, expending over $3 million during AY 1994. The expenditures for these projects ranged in value rom $119 to $623,000. Each reimbursable project was unique,

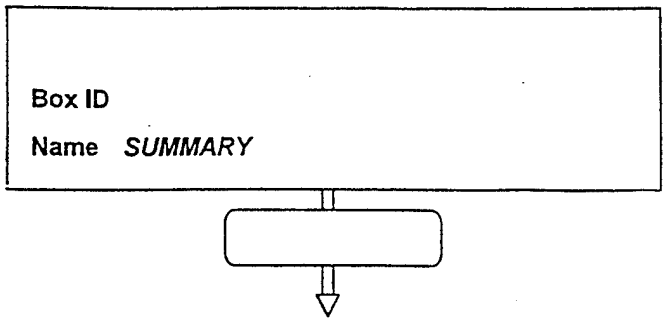
drawing varying amounts of resources. Three projects, the BUMED Executive Management Education, the Defense Acquisition University (DAU) course development project, and the NAVCOMPT Practical Comptrollership Courses represent approximately 45 percent of reimbursable project expenditures. Because of the significant nature of these expenditures, these projects were traced separately from other reimbursable projects. The abbreviations used in the model for reimbursable project demands are:

1. RES (Research).
2. RDAU (Defense Acquisition University).
3. REME (BUMED).
4. RSHT (NAVCOMPT short courses).

B. SUMMARY BOXES

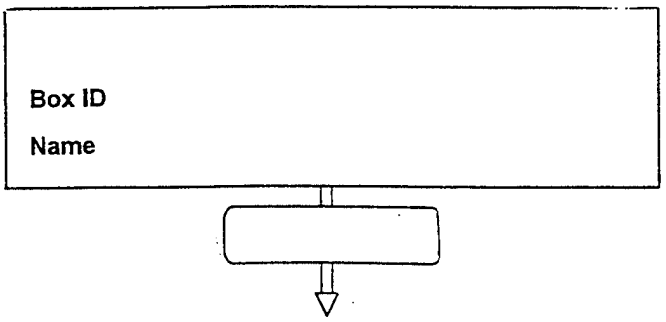
Summary boxes are required to be used in this model when multiple processes are required to produce a single output or demand. The summary box can be used to accumulate the output of either multiple processes and/or other summary boxes. In this model, two levels of summary boxes are required. The upper level of summary boxes accumulates the different sub-processes required to produce a single output. The lower level of summary boxes accumulates the upper level of summary boxes to those identified with a specific output. This summary box consolidates activities which are then drawn (or activated) by the output (e.g., number of theses advised) or demand boxes. Summary boxes are identified in the model by adding a single letter suffix to either a demand or process

abbreviation as appropriate. For example, the summary boxes for the aggregation of processes for the 837 curriculum output are labeled 837A, 837B, 837C, etc. The summary box is represented schematically in the model by the following symbol:



C. PROCESS BOXES

Processes are critical combinations of activities required to produce an output (e.g., a section of a course); processes are also the methods through which resources are converted into output. Process boxes are schematically represented with the following symbol:



Only the three primary activities of the Systems Management Department are discussed in this model:

1. Teaching.
2. Thesis advising.
3. Producing reimbursable projects.

1. Teaching

Teaching is defined in this model as a faculty member conducting a course section. Each course section is treated as a separate activity. Normally each faculty member conducts two four-hour courses per quarter, although this may be increased or decreased based on faculty member desires and his or her other activities such as thesis advising and reimbursable projects. (Thomas, 1991) In this model, a faculty member acting as an academic associate is considered teaching. Teaching activity boxes are identified by the letter "T" followed by three numbers, such as T201.

2. Thesis Advising

Thesis advising is defined as a faculty member acting as a primary advisor, co-advisor, or associate advisor for a degree candidate as recorded by the Systems Management Department's Assistant Chair for Instruction's Office. This is the most readily available data. Thesis advising activity boxes are identified in the model by the letters "TH" followed by a faculty member's personnel code. For example, THGT represents Professor Gates' thesis advising activities.

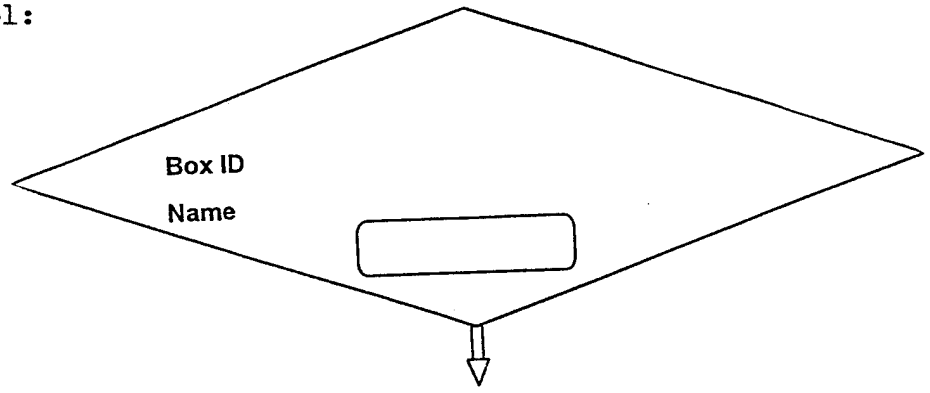
3. Reimbursable Projects

Reimbursable projects are primarily conducted by a faculty member, but he or she may be assisted by staff members or degree candidates. For measurement purposes, a

faculty member being recorded as working on a reimbursable project was counted as an output. Research activity boxes were identified in the model with the letters "RE" followed by a faculty members personnel code. For example, RESM is Professor San Miguel's reimbursable project activities.

D. ROUTE BOXES

Route boxes are located above summary boxes and below process boxes in the operational flow of the model when there are multiple sources of the same activity (such as multiple sections of the same course) or resource. The route box draws capacity from the multiple input activities until the input activities capacity is exhausted based on a use policy that may be adjusted to reflect actual use of resources or activities. For example, in AY 1994 five sections of MN2031 were conducted. Each section has a defined capacity of 30 students. If total demand for the course was 91 students enrolled, then the route box would draw 18.20 students from each section. In this model, there is a route box for every course offered by the Department. Route boxes are schematically represented in the model by the following symbol:

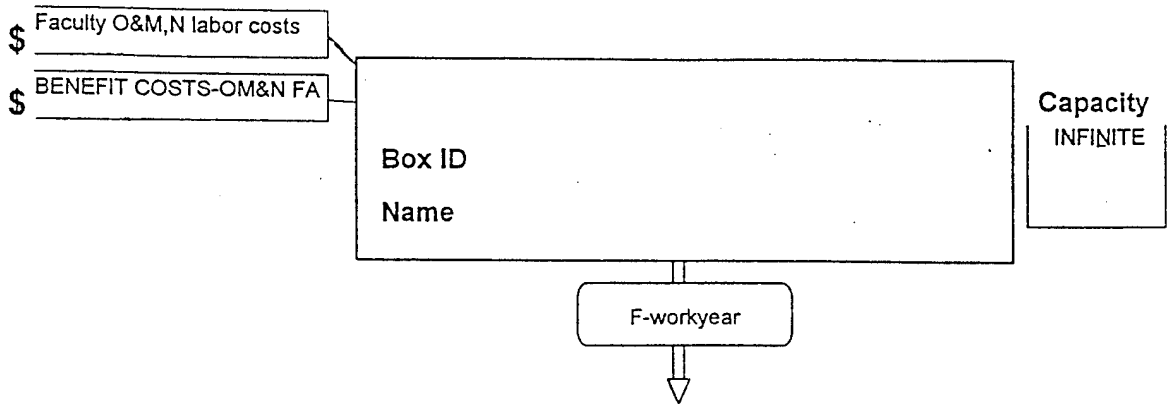


E. RESOURCES

Resources are expended during processes in the production of outputs and represent the top level of the model. At the school, the most financially significant resources are staff and faculty labor. These two resources represent approximately 75 percent of all expenditures for the operation of the school and conducting research. Expenditures for labor are fixed by congressionally mandated full time equivalent limitations and by the fact that most of the faculty and staff are salaried rather than hourly employees.

Other resources consumed by Systems Management Department activities include the cost of maintenance ($23,191) and cleaning ($88,500) of Ingersoll Hall, and the cost of printing services ($55,253) provided by the Defense Printing Office. These costs were manually calculated by reviewing the Public Works Center (PWC) maintenance records, the school's janitorial service contract, and printing requests generated by the Systems Management Department. These services are centrally managed by either PWC or the Comptroller's office. For this model, a more precise activity-base cost estimate was made possible by tracing these costs to the consuming department rather than using an allocation based on the number of students in a department. However, the resources consumed in the administration of the school, and in providing the services of the Dudley Knox

Library and the Church Computer Center were allocated on the basis of the number of students assigned to a department. Additionally, this method does not consider the impact of reimbursable projects on the use of the library and computer center. Other measurements of use could more accurately trace these cost departments. Resources are schematically represented by the following symbol as:



CHAPTER IV: THE SYSTEMS MANAGEMENT DEPARTMENT ACTIVITY-BASED COSTING MODEL

This chapter provides a detailed analysis of the activity-based costing model developed for the Systems Management Department at the Naval Postgraduate School. The first section provides an explanation of costing assumptions used in the model. Following the discussion of assumptions, three separate examples are developed to demonstrate the effectiveness of the activity-based costing model. Each example provides a flow chart demonstrating how costs are drawn to the outputs and explanations of how all numerical values were determined for the model.

The first example analyzed is the 837 Financial Management Curriculum. A detailed discussion follows tracing resource use from the average on board count of 69 students to the activities and cost associated with providing classroom education to a curriculum. The second analysis traces the consumption of resources (e.g., faculty salary and benefits) by the various activities (conducting classroom education, theses advising, conducting reimbursable projects, participating in the BUMED executive management education (EME) program) in which a faculty member participates. The representative faculty member whose activities are analyzed is Professor Gates. The third section analyzed is a teaching activity. During AY 1994, six course sections of MN3154 were offered in which 220 students enrolled. The

discussion traces demand for activities from the teaching activity to the various outputs.

The analysis of the model attempts to provide an adequate explanation for the relationships between the outputs, activities and the cost of these activities. An assumption has been made that the reader has a minimal working knowledge of Sapling's NetProphet® II software.

A. MODELING ASSUMPTIONS

This section provides an explanation of some of the basic model assumptions. The first sub-section provides the information on salary and benefit costs for faculty and staff of the school. The second subsection describes how the model draws costs from resources to different type activities. The third subsection discusses the cost of classroom education overhead.

1. Cost of Salary and Benefits

Approximately 73 percent of the school's operational budget is allocated to meet staff and faculty salaries. In addition to the cost of salaries, the cost of benefits for the civilian faculty and staff members is approximately 43 percent of the member's base salary. Because of the sensitive nature of salary information and privacy concerns, actual salary figures for individual employees were not included in the model. Instead, approximate salaries and benefit costs were substituted throughout the model. These substituted costs are discussed below.

a. Civilian Faculty Members

Civilian faculty salary and benefit costs used in the model were approximated by position. For example, all faculty members holding the position of dean were assumed to be identically salaried. Salary and benefit figures for civilian faculty members used in the model are listed in Table 4. In addition to full-time salaried faculty members, the Systems Management Department also contracts with qualified personnel to teach specific courses. If the faculty member was not a permanent member of the staff, the salary cost was assumed to be $3,000 per course. The cost of benefits for these personnel was assumed to be $1,290, although currently these personnel do not receive benefits.

b. Military Staff and Faculty Members

The cost of military salaries and benefits for AY 1994 were approximated using the Comptroller of the Navy Notice 7041 (NAVCOMPTNOTE 7041), dated 8 December 1992. This notice sets composite standard rates for recovery of costs associated with military service personnel. Table 5 provides the composite rates from the NAVCOMPT Notice that are relevant to the model. A composite rate includes the cost of the military member's salary, pay allowances and fringe benefits.

Position	Salary	Benefits	Total
Provost	$100,000	$ 43,000	$143,000
Dean	$ 90,000	$ 38,700	$128,700
Director Of Academic Planning	$ 90,000	$ 38,700	$128,700
Department Chair	$ 80,000	$ 34,400	$114,400
Professor	$ 80,000	$ 34,400	$114,400
Associate Professor	$ 70,000	$ 30,100	$100,100
Assistant Professor	$ 60,000	$ 25,800	$ 85,800
Lecturer	$ 60,000	$ 25,800	$ 85,800

Table 4. Civilian Faculty Salary And Benefits

Paygrade	Rank	Composite Rate
O-8	Rear Admiral	$148,130
O-6	Captain (Navy)	$119,249
O-5	Commander	$100,706
O-4	Lieutenant Commander	$ 84,925
O-3	Lieutenant	$ 2,359
E-6	First Class Petty Officer	$ 41,114

Table 5. Military Composite Rates

c. Non-Faculty Civilian Staff Members.

All non-faculty civilian staff members are represented in the model as salaried at $30,000. The benefit costs are represented as $12,900 for a total cost of $42,900.

2. Allocation of Costs Between Activities

If a civilian faculty member participated in reimbursable projects, one half of the total cost of the member's salary and benefits were allocated for the member's direct teaching activities and one half of the salary and benefit costs were allocated to the member's reimbursable activities. This is consistent with information provided by the Systems Management Department Administrative Officer, that generally one-half of the total salary and benefits of faculty members, who participated in reimbursable research was funded from reimbursable funds (Johnson, 1995).

If a military faculty members participated in reimbursable projects, 75 percent of the cost of his or her salary and benefits were drawn by direct teaching activities, while 25 percent of the cost of his or her salary and benefits were drawn by reimbursable activities. The rationale to support this decision is two fold: 1) Military faculty members, in general, taught at least six course sections during the year so that a significantly greater percentage of the military faculty member's activities are related to direct teaching activities than a civilian faculty

member's activities. 2) The military member's salary is paid from the Military Personnel Appropriation, not from the school's operating allocation or from reimbursable funds, so records do not exist that specifically detail the number of days the military member spends on reimbursable activities.

Non-faculty civilian staff members' salary and benefit costs were apportioned based on a 1994 survey provided by the Systems Management Department Administrative Officer, which approximated the percentage of time that each staff member was engaged in support of direct teaching activities and in support of reimbursable projects.

a. Reimbursable Activities

Reimbursable activities include research projects, the BUMED Executive Management Education (EME) project, NAVCOMPT Practical Comptrollership short courses, and the DAU project. The financial resources consumed, how time was spent, and the activities associated with reimbursable projects, unlike classroom education or thesis advising, are difficult to measure and each project is unique. Because each reimbursable project is unique, it is difficult to develop a common measure of output as was developed for classroom education and thesis advising. The assumptions used in this model concerning reimbursable activities are: 1) Reimbursable project activity output was defined as a faculty member participating in an reimbursable project activity, as recorded in the school's Research Office. A

total of 37 Systems Management Department faculty members participated in reimbursable projects in AY 1994. 2) If a faculty member participated in independent research projects and did not participate in the BUMED EME project or the DAU project, the independent research projects drew 100 percent of the cost of the faculty member's salary and benefits for the half of the year paid by reimbursable activities. 3) If a faculty member participated in both independent reimbursable projects and the BUMED EME project or the DAU project, then 75 percent of the cost of salaries and benefits for the half of the year allocated to reimbursable activities would be drawn by the independent research project and 25 percent of these costs would be drawn by either the BUMED EME or the DAU project. 4) If the faculty member participated only in the BUMED EME or DAU project, then 100 percent of the costs of the faculty member's salary and benefits for the half of the year covered by reimbursable activities were drawn by either the BUMED EME or the DAU project. The assumptions concerning the NAVCOMPT Practical Comptrollership course affected only one faculty member and are discussed in the last section of this chapter.

Additionally, 30 non-faculty staff members were identified as providing support to reimbursable projects. With the exception of those staff members working exclusively on the DAU project, it was not possible to identify which reimbursable project or faculty member the staff member

primarily supported. Therefore, the aggregated costs of these staff members were assumed to benefit each faculty member who participated in reimbursable projects equally. The approximate benefit drawn to each working faculty member or reimbursable project for this support was $15,408. The cost of salaries and benefits for the staff exclusively supporting the DAU project was allocated directly to the DAU project output.

b. Direct Teaching Activities

Direct teaching activities consist of classroom education, the administration of the curricula by the academic associates, and thesis advising. Classroom education was measured by course sections. In the model, acting as an academic associate, was equated to a faculty member teaching one section of a four credit hour course, and was drawn directly into the curriculum summary box.

Thesis advising was measured by the number of theses advised and the role of the faculty member. A faculty member whose role was primary thesis advisor received the equivalent credit of teaching a one credit hour course. A faculty member whose role was co-advisor on a thesis received the equivalent credit of teaching a .75 credit hour course. A faculty member whose role was associate advisor received the credit of teaching an one-half credit hour course.

In order to determine the costs of teaching, thesis advising, and acting as an academic associate, it is

necessary to equate all three activities in terms of a common measure. To accomplish this, the number of thesis advising credits that a faculty member earned was divided by four, the average number of credit hours per course section. This in effect, equated the system of measurement for all three activities, so that each system could draw proportionately the costs associated with a faculty member's direct teaching activities. For example, if a faculty member acted as the primary thesis advisor for five theses and associate thesis advisor for six theses, the faculty member would earn the equivalent of eight student contact credit hours or two four credit hour courses. If the faculty member also taught two course sections and acted as the academic associate, the thesis advising would draw 40 percent of the faculty member's direct teaching costs. Each course section taught would draw 20 percent of the direct teaching costs, as would the academic associate activity.

c. Academic Overhead

Within the school and the Systems Management Department there are costs associated with the school which currently cannot be traced to specific activities or departments. These costs include the cost of the academic and the military administration of the school, the cost of the Dudley Knox Library, and the Church Computer Center. One-third of these costs were allocated to the Systems Management Department, and the other two-thirds were

allocated to the other departments based on the assumption that these costs are drawn relatively equally by all students in the school. Obviously, this assumption can be questioned, but for the purposes of this thesis the assumption provided a reasonable method to distribute the costs.

Additionally, this allocation does not account for the use of these resources by faculty members, private citizens of the community, and individuals working on reimbursable projects. The cost of the Systems Management Department Chair's Office, the Curricular Office, the cost of printing for the Systems Management Department, and the maintenance of Ingersoll Hall were considered primarily to be a cost of classroom education, ignoring the effect of reimbursable projects. These costs and the cost of salaries and benefits for the non-faculty staff whose activities are in support of instruction, were distributed to System Management Department curricula based on the number of students in each curriculum.

B. THE 837 FINANCIAL MANAGEMENT CURRICULUM

1. Output Box

During Academic Year 1994, 73 Financial Management students were enrolled in the Fall Quarter, 66 Financial Management students were enrolled in Winter Quarter, 64 Financial Management students were enrolled in Spring Quarter and 72 Financial Management students were enrolled in Summer Quarter. This averages to 68.75 or 69 students enrolled in

the Financial Management Curriculum during AY 1994. This quantity is used to represent the 837 Curriculum output during AY 1994. Appendix A is a schematic representation of the cost flows of the 837 Curriculum from the output box to the resources represented by an instructor for a section of MN3172.

In the schematics in Appendix A, the 837 output box is connected to a summary box 837A. The output demand of 69 is multiplied by a factor of 1/69 or approximately .0144. The model accumulates all costs of providing classroom education to the students in a curriculum and then determine the average cost per student by dividing the total costs by the number of students in a curriculum.

2. Summary Boxes

The box labeled 837A is a summary box. The only function of this box is to aggregate multiple inputs from summary boxes 837B through 837K into a single location that is then drawn by the 837 output box. Each summary box has the potential to aggregate ten inputs into a single location. Because of the number of activities (course sections) that are required to produce a single output (an 837 student), more than one summary box is required.

3. Factors and Route Boxes

Each of the upper level summary boxes (837B-837K) is connected to several route boxes which represent the various courses offered by the Systems Management Department. A

detailed discussion of these route boxes follows. Also connected to the summary boxes are activity boxes that represent courses offered by other departments, the activities of faculty members serving as academic associates, and boxes which represent the school's overhead costs. These other costs and activities are discussed following the discussion of the route boxes which represent classroom education.

a. Route Box Factors

The route box factors are the primary method for determining the cost of the classroom education that each curriculum drew during AY 1994. These route boxes, for example, F = 1.525 for box 4162. Factors are the product of the number of course sections and the percentage of all students enrolled in a course from a particular curriculum. For example, if a total of 59 students were enrolled in the two MN4162 sections, and 45 of the students were from the 837 Curriculum, the factor between the 837 Curriculum summary box and the MN4162 route box would be 1.525.

The summary box 837F, shown in Appendix A, will be analyzed in detail in Table 6. Table 6 provides a listing of the route box identifications, which is the same as the course number which they represent, the number of sections per course, the total number of students enrolled in the course, the number of 837 Curriculum students, and the factor or number of sections required by the 837 Curriculum.

Slight discrepancies exist between the table and the computer generated factors in the flowchart due to rounding errors.

b. Classroom Education Route Boxes

Every course conducted by a member of the Systems Management Department faculty during AY 1994 is represented by a route box. The output of the route boxes are drawn by the various summary boxes, based on the factors discussed above. The inputs to the route boxes are activity boxes which represent the individual course sections.

Route Box/ Course No.	No. Of Sections	Total No. Of Students	837 Students	Factor*
3172	7	186	29	1.091
4152	2	36	31	1.720
4153	2	31	24	1.548
4159	1	18	17	.944
4161	2	53	44	1.660
4162	2	59	45	1.525
4163	2	22	12	1.091
4302	0	0	0	0

*Rounded To Nearest Thousandth

Table 6. Table Of Box 837F Factors

Each route box has been programmed to draw the demand generated by the curriculum summary boxes equally from all inputs. For example, route box MN3172 in Appendix A, draws demand equally from the seven inputs (the seven sections of MN3172, T342 through T348). Table 7 provides a listing of the eight route boxes connected to summary box 837F, the activity boxes representing the individual sections of each course, the faculty member who conducted the course section, the cost per section, the average cost per course, the number of sections drawn by the 837 curriculum, and the cost of the course sections drawn by the 837 Curriculum. Minor discrepancies exist between manual calculations and calculations made by the model. These errors are primarily attributable to differences in the number of significant decimal places used in multiplication. Because this model is only an approximation of costs, these errors are not considered significant. In Appendix B, there is a listing of all Systems Management Department courses, the number of sections drawn by the 837 Curriculum, and the associated costs drawn by the 837 Curriculum. In Appendix C, a table provides a listing of all Systems Management courses, the number of sections conducted during AY 1994, the average number of students per section, the average cost per section, and the average cost per student.

Course No./ Route Box	Section ID No./ Activity Box No.	Faculty Member	Cost Per Section*	Avg. Cost Per Course	Sec-tions Drawn By 837	Cost Drawn To 837*
3172	T342	SMMM	$ 9,390	$ 9,348	1.091	$10,190
	T343	SMMM	$ 9,390			
	T344	SMDY	$ 9,244			
	T345	SMDY	$ 9,244			
	T346	SMMM	$ 9,390			
	T347	SMMM	$ 9,390			
	T348	SMMM	$ 9,390			
4152	T351	SMNE	$28,122	$28,122	1.723	$48,370
	T352	SMNE	$28,122			
4153	T353	SMML	$30,949	$30,949	1.548	$47,910
	T354	SMML	$30,949			
4159	T355	SMMO	$18,199	$18,199	.944	$17,107
4161	T356	SMSM	$11,121	$17,512	1.660	$29,070
	T357	SMEE	$23,901			
4162	T358	SMSM	$11,234	$17,687	1.525	$26,973
	T359	SMEE	$24,140			
4163	T360	SMLC	$ 7,503	$ 7,503	1.091	$ 8,185
	T361	SMLC	$ 7,503			
4302	T362	0	0	0	0	0
	T363	0	0			

*Rounded To Nearest Dollar

Table 7. 837F Route Boxes And Activity Boxes

c. Courses Offered by Other Departments

In addition to Systems Management Department courses, students in the 837 Curriculum also enrolled in classes taught by faculty members of other academic departments. Because of a lack of information concerning other academic departments, all course sections in these other departments were assumed to be conducted by associate professors and each section consisted of 30 students.

d. Average Cost Per Student

Under the constraints of this model, the average cost per student in the 837 Curriculum is $12,656 per student. A report generated by the model, detailing the average cost of all outputs is included in Appendix D.

C. FACULTY ACTIVITIES

This section of the thesis analyzes the flow of costs from a faculty member to the activities which transform his or her labor to classroom education, thesis advising or reimbursable project. The faculty member whose activities were examined is Professor Gates.

1. Professor Gates' Activities

Professor Gates is an associate professor in the Systems Management Department, who during AY 1994 taught a total of four course sections, acted as a primary thesis advisor, acted as an associate thesis advisor, and participated in reimbursable projects. Per the constraints of the model, his total salary was set at $70,000. The acceleration rate of 43

percent provides a benefit cost of $30,100. Both the cost of the salary and benefits were evenly divided between direct teaching activities and reimbursable activities or $50,050 for each type of activity.

a. Direct Teaching Activities

During AY 1994, Professor Gates taught four, four credit course sections: one section of IS3170 (T529), one section of MN2039 (T411), and two sections of MN3140 (T417 and T418). He also acted as the primary thesis advisor for six students and as the associate thesis advisor for six students, for which he received a total of nine equivalent student contact credit hours. Appendix E is a schematic representation of one of Professor Gates' direct teaching activities. The schematic in Appendix E traces the resources represented by the costs of Professor Gates' salary and benefits to a section of MN3140, and then are drawn to the 837 Curriculum.

Professor Gates is represented by the box identified as SMGT. It is connected to the four activity boxes (T411, T417, T418 and T529) which represent the four course sections that Professor Gates taught in AY 1994. It is also connected to box THGT which represents Professor Gates thesis advising activities. The factor of 0.25 reduces the thesis advising credits from 9 to 2.25 and equates the thesis advising activity to teaching 2.25 four credit hour classes. This allows the software to distribute the cost

proportionately to the four courses and the thesis advising activities. Table 8 shows the model's distribution of Professor Gates direct teaching costs, the cost per credit, the cost of each of Professor Gates' activities, and the average cost of conducting one course section.

Box ID Number	Activity	Number Of Credits	Cost* Per Credit	Prof. Gates' Activity Cost*	Avg. Course Section Cost*
T411	MN2039	4	$ 2,002	$ 8,007	$ 8,007
T417	MN3140	4	$ 2,002	$ 8,007	$ 6,400
T418	MN3140	4	$ 2,002	$ 8,007	$ 6,400
T529	IS3170	4	$ 2,002	$ 8,007	$10,797
THGT	THESIS ADVISING	9	$ 2,002	$18,018	NA

*Rounded To Nearest Dollar

Table 8. Distribution Of Salary And Benefit Costs

Professor Gates' costs for classroom education are drawn to the curriculum based on the percentage of the total number of students from each curriculum enrolled in a course. For example, ten students were enrolled in the MN2039 course taught by Professor Gates. One of the students was from the 815 Curriculum and nine of the students were from the 820 Curriculum. Hence, ten percent of the cost of the course or $801 was drawn by the 815 Curriculum and 90 percent of the

cost or $7,206 was drawn by the 820 Curriculum. These cost flows are represented by the summary boxes 820G in Appendix F.

The cost of conducting thesis advising is ultimately drawn to three demand boxes as shown by the schematic diagram in Appendix G. THEA represents the faculty member acting as an associate thesis advisor. THEC represents the faculty member acting as a co-advisor on a thesis, and THEP represents the faculty member acting as the primary thesis advisor. As described in Chapter IV, a faculty member receives student contact credit hours for acting as a thesis advisor. The total number of credits earned by the faculty member for advising during the academic year is the upper limit of the faculty member's thesis advising box. For example, Professor Gates received nine equivalent credit hours for his thesis advising activities. Setting the upper limit or capacity of the box THGT at 9.0 constrains the number of credits which can be drawn by the route box to 9.0 and maintains the ratio of $2,002 of costs per credit. The costs of Professor Gates' thesis advising are drawn from the route box THE3 to the summary box THO1. Table 9 provides a listing of the thesis advising activity boxes which corresponds to each faculty member listed in Appendix G, the number of credit hour received for thesis advising, the cost per thesis advising credit and the total cost of thesis advising for each faculty member drawn through

route box THE3. The number of thesis advising credits is from a report obtained from the Chair for Instruction which summarizes only the thesis advising provided to Systems Management Department students. The summary box, THO1 compiled all costs associated with thesis advising through route boxes THE1 through THE8. The factors visible in Appendix G, between the route boxes and the summary box THOA represent the percentage of the total thesis advising credits, drawn from each route box.

These costs are drawn by the three output boxes, THEA, THEC, and THEP. The quantity and the associated costs drawn by each output box is determined by the number of times the System Management Department Faculty acted as a primary, associate or co-advisor on a thesis. The demand generated by each output boxes is multiplied by the same factor (1.0, 0.5, or 0.75) that is used to award thesis credit hours. Hence, the primary thesis advising output box draws costs at a ratio of 1.00 for every unit of demand, while the associate thesis advising output box draws 0.50 per unit demanded and the co-advisor thesis advising output box draws 0.75 per unit demanded.

Box Identification	Thesis Advising Credit Hours	Cost Per Thesis Credit*	Total Cost Of Thesis Advising*
THEV	2.00	$4,459	$ 8,918
THFW	.75	$5,760	$ 4,320
THGT	9.00	$2,003	$ 18,027
THHA	5.50	$3,388	$ 18,634
THHC	3.00	$6,148	$ 18,453
THHG	1.25	$5,232	$ 6,540
THHI	8.75	$1,991	$ 17,421
THHN	0	0	0
THHO	5.85	$8,727	$ 51,052

*Rounded To Nearest Dollar

Table 9. Route Box THE3

b. Reimbursable Activities

Professor Gates reimbursable activities included the BUMED executive management education (EME) program and two research projects on Drug Demand Reduction in the DOD. In accordance with the assumptions listed in the beginning of this chapter, 75 percent of the costs associated with Professor Gates' reimbursable activities are drawn by the research projects. The cost associated with Professor Gates reimbursable activities are: salary ($35,000), benefits ($15,050), and a proportional share ($15,408) of the total cost of the staff support for reimbursable activities.

Appendix H is a schematic representation of Professor Gates reimbursable activities. Box REGT represents Professor Gates reimbursable activities. The box is modeled

so that it will draw input from activity box STRA which represent staff reimbursable support costs. The factor for box STRA is the reciprocal of the number of types of reimbursable projects in which each faculty member participates. The reciprocal programs the software to distribute the cost of the support staff evenly to all faculty members participating in reimbursable research. In the case of Professor Gates, he participated in reimbursable research projects (1.00 projects) and in the BUMED EME project (.25 project) for a total of 1.25 projects. Each of these projects are shown on separate schematics in Appendix G. Because these activities are traced on separate pages the factor 1.25 is not displayed on either schematic. This factor varies slightly from the factor generated by the model due to rounding errors in the route box.[1]

The output of activity box REGT is drawn by two route boxes. The first route box, REMB acts as a summary box for the BUMED EME project. It draws 25 percent of the total costs of each activity box with which it is connected. The amount of costs drawn from box REGT is $13,304. The output of the route box REMB is drawn by the box RMEA. The route

[1]The Net Prophet II® software considers all decimal places of a number significant. Consequently, any fraction represented as a decimal that is not evenly divisible by either two or five, when used in the model for calculations will cause a slight error.
This is most noticeable in software produced reports, where the cost of a faculty members activities should be identical and vary slightly. Because of the high dollar value of most activity costs, these errors are considered insignificant.

box RMEA, acts as a summary box for route boxes, REMB, REMC, and REMD and draw all costs associated with these boxes to the output box REME. The total cost drawn to output box REME is $685,636.

The second route box, RES3, draws all costs not drawn by the route box REMB, or $52,155 and represents the cost of independent reimbursable projects. The route box is programmed only to draw costs from those faculty members who participated in a independent reimbursable project during AY 1994, so some factors are set at zero. The aggregated costs of route box RES3 are drawn by route box RESB which acts as a summary box. Route box RESB draws the costs from the route boxes, RES1 through RES8 to establish the aggregate cost of all independent reimbursable projects. The cost of the reimbursable research projects is then draw to the output box RES. The volume of 37 demands in the output box represents one demand for each faculty member participating in a research project. The total cost of reimbursable research drawn to the Box RES is $2,393,272.

D. SYSTEMS MANAGEMENT COURSE MN3154

Financial Management in the Armed Forces is a four credit hour course required for graduation in all Systems Management Curricula except the 817, 820 and 847 curricula. In AY 1994, six course sections were offered, in which a total of 220 students were enrolled. CDR Kalmar was the faculty member who instructed all six sections. In addition

to teaching the six course sections of MN3154, CDR Kalmar acted as an associate thesis advisor for nine students and taught six Practical Comptrollership short courses. The cost of teaching one course section of MN3154 was approximately $7,125. This cost amount was determined in the same manner as described above, by first determining the proportional value of thesis advising credits, and then dividing all direct teaching costs by the number of activities. CDR Kalmar's reimbursable activities consumed approximately 50 percent of the resources associated with his activities or $50,353 (Kalmar, 1995). This allocation of resources between reimbursable and direct teaching activities adheres to CDR Kalmar's estimation of time requirements for each activity although it varies from the assumptions listed at the beginning of the chapter. Table 10 is a breakdown of CDR Kalmar's activities and the cost of each activity.

Activity	Cost Per Unit*	Number Of Units	Total Costs*
MN3154	$7,054	6.0	$42,324
Thesis Advising	$1,782	4.5	$ 8,019
Short Courses	$8,392	6.0	$50,353

*Rounded To Nearest Dollar

Table 10. Cost Of CDR Kalmar's Activities

Appendix I is a schematic representation of the cost flows from the six MN3154 course sections to the 827 Curriculum. The top box in the schematic, the activity box SMKL, represents CDR Kalmar and the cost of his salary and benefits, $50,353 for direct teaching activities. CDR Kalmar's direct teaching activities are instructing six MN3154 course sections (Boxes T329 through T334), and acting as an associate thesis advisor for nine students (Box THKL).

The cost of the six course sections of MN3154 are drawn equally by the route box 3154. Resources or costs are drawn from the route box 3154 by students from the various curricula and academic departments enrolled in MN3154 sections. In Appendix I, the demand represented by students enrolled in MN3154 is drawn to the output boxes through curricula summary boxes. Table 11 provides a listing of curricula or academic department, the curricula summary box identification numbers, the number of students from each curricula or academic department enrolled in MN3154, the number of sections (factors) which each curriculum or academic department required for its students, and the costs associated with this factor. These costs are then drawn from the summary boxes to the output boxes.

Curriculum Number	Box Identifi-cation	Number Of Students	Number Of Sections	Cost Drawn To The Curriculum*
370	370H	70	1.8900	$ 13,332
813	813E	4	.1080	$ 762
814	814E	10	.2700	$ 1,905
815	815E	23	.6210	$ 4,381
816	816E	37	1.0000	$ 7,054
817	817E	2	.0540	$ 381
827	819E	28	.7560	$ 5,333
820	820E	0	0	0
837	837E	34	.9180	$ 6,476
847	847E	0	0	0
NSA	ENSO	1	.0277	$ 195
OR	EOAA	4	.1108	$ 782
EE	EEEB	3	.0754	$ 532
AA	EAAA	1	.0277	$ 195

* Rounded To Nearest Dollar

Table 11. MN3154 Students

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The primary purpose of this thesis was to demonstrate the applicability of Activity Based Costing to the Systems Management Department at the Naval Postgraduate School for use by school administration personnel. The primary research question entailed the identification of major activities and the associated cost flows of the Systems Management Department.

1. Identification of Faculty Activity Costflows

a. Direct Teaching Activities

The thesis as demonstrated the ability to accurately model the direct teaching. Although the model developed for this thesis used approximate salary data, this model generated approximate unit costs for providing classroom education to students in the Systems Management Department Curricula. Additionally, the model also generated approximate cost estimates for the various Systems Management Department courses, tracing the consumption of resources from faculty members to course sections to individual curricula.

In addition to establishing cost estimates for conducting individual sections of Systems Management Department courses, the model also demonstrated the ability to apply activity-based costing to the process of thesis advising. The model provides a method to establish the cost of a faculty member acting as either a primary advisor,

associate advisor, or co-advisor on a thesis for Systems Management Department students. The accuracy of cost estimates for thesis advising would increase if data were available for Systems Management Department faculty acting as a thesis advisor for students in academic departments other than the Systems Management Department.

b. Reimbursable Activities

The use of the computerized activity-based costing model developed for this model is an effective means for establishing cost estimates for the various reimbursable activities in which the Systems Management Department faculty members are engaged. Because each reimbursable project is unique, requiring activities or process that may apply only to an individual project, it is difficult to derive precise activity-based cost estimates without detailed data for each reimbursable project. The precision of the model generated cost estimates could be increased if data concerning the actual number of days faculty member devoted to each reimbursable project or activity was made available.

2. Identification of Staff Activity Costflows

The model can accurately provide activity-based cost estimates for the staff members' activities. However, the model's precision could be refined with detailed data concerning the amount of time staff members labored on individual assignments, and whether these assignments were in support of a particular academic course or reimbursable

project. This data is necessary because of the unique nature of the staff support for each course and reimbursable project.

B. RECOMMENDATIONS

As stated above, additional information is required for the model to produce more precise approximate costs for the Systems Management Department's activities. The Faculty Payroll Certification contains the data on the number of days each faculty member spends on direct teaching activities and on reimbursable projects. With this additional information, it would be possible to either verify or alter the assumptions in the computer based model, as necessary, to determine actual Systems Management Department faculty activity costs. Modification of the computer based model with this data could be accomplished within two to three hours.

To refine the cost estimates of the activities of the staff requires the collection of additional data. This could be accomplished by modifying how faculty members request staff support. Under the current system, faculty members generally request staff support informally. The faculty members should instead request these services on a standard form, specifying which course or reimbursable project the requested services supported. The staff member could then record on the standard form the staff members who provided the services and the approximate number of staff hours spent

to support the project. This could lead to greater accuracy in determining the cost of the various Systems Management Department staff outputs and allow for the reduction of unplanned subsidization of mission funded activities by reimbursable project funds or vice versa. The data collected over an extended period could serve as a baseline for allocation of staff costs between direct teaching activities and reimbursable activities. This would also allow for establishing the cost of specific curricula.

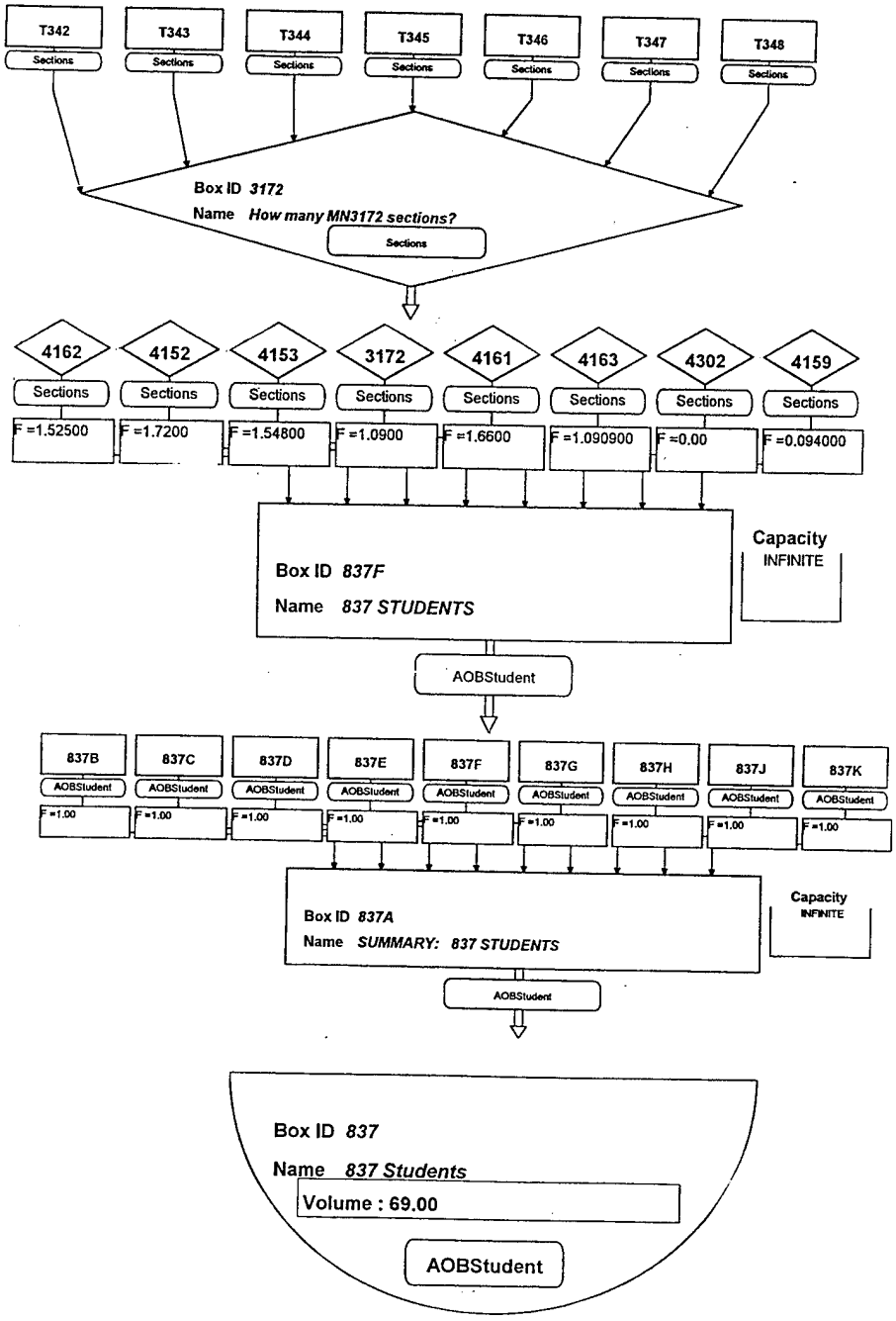
Because labor costs account for approximately 73 percent of all costs associated with the school, the greatest benefits can be realized by the accurate modeling of labor cost data. However, additional data collection concerning non-labor related costs may also provide the administration cost beneficial data to aid in decision making. Two areas where cost data collection would be relatively inexpensive are requests for printing services provided by the Defense Printing Office and the cost of providing photocopier services for the different types of outputs.

The printing requests currently used by the Systems Management Department contain information required by the Defense Printing Office such as name and telephone number of requester, date required, purpose and special instructions for the print shop. On the form, under the heading "Purpose" there are spaces to designate whether the project is for a course, RIP/DFR order, or a reimbursable order. The

requester at the time of initiating the print request could designate by course number or reimbursable project name what the print category purpose, could be modified by the specific activity for which the printing was accomplished. In this manner, the cost of printing could be traced to either the course or project which benefited from the printing, allowing for more precise cost estimates of activities. Although the Systems Management Department only expended approximately $50,000 on printing in AY 1994, it appears that a few programs were responsible for a disproportionate share of this $50,000. If this is true, then the true cost of the curriculum could be radically different than estimated by the model.

Similarly, the approximate cost of providing photocopier service for direct teaching activities and reimbursable activities could be established by assigning each staff and faculty member two access codes for use of school provided photocopiers. One access code would be used for photocopying jobs for direct teaching activities and the other for reimbursable projects. Hence, the percentage that each photocopier is used for reimbursable or direct teaching activities could be established and aid in decision making in setting school overhead rates for reimbursable projects. Tracing the cost of photocopier services beyond reimbursable or direct teaching is not likely to be cost beneficial at providing usable data for administration decision making.

APPENDIX A. 837 CURRICULUM FLOWCHART


T342
Sections
T343
Sections
T344
Sections
T345
Sections
T346
Sections
T347
Sections
T348
Sections
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Name How many MN3172 sections?
Sections
4162
Sections
F =1.52500
4152
Sections
F =1.7200
4153
Sections
F =1.54800
3172
Sections
F =1.0900
4161
Sections
F =1.6600
4163
Sections
F =1.090900
4302
Sections
F =0.00
4159
Sections
F =0.094000
Box ID 837F
Name 837 STUDENTS
Capacity
INFINITE
AOBStudent
837B
AOBStudent
F =1.00
837C
AOBStudent
F =1.00
837D
AOBStudent
F =1.00
837E
AOBStudent
F =1.00
837F
AOBStudent
F =1.00
837G
AOBStudent
F =1.00
837H
AOBStudent
F =1.00
837J
AOBStudent
F =1.00
837K
AOBStudent
F =1.00
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Capacity
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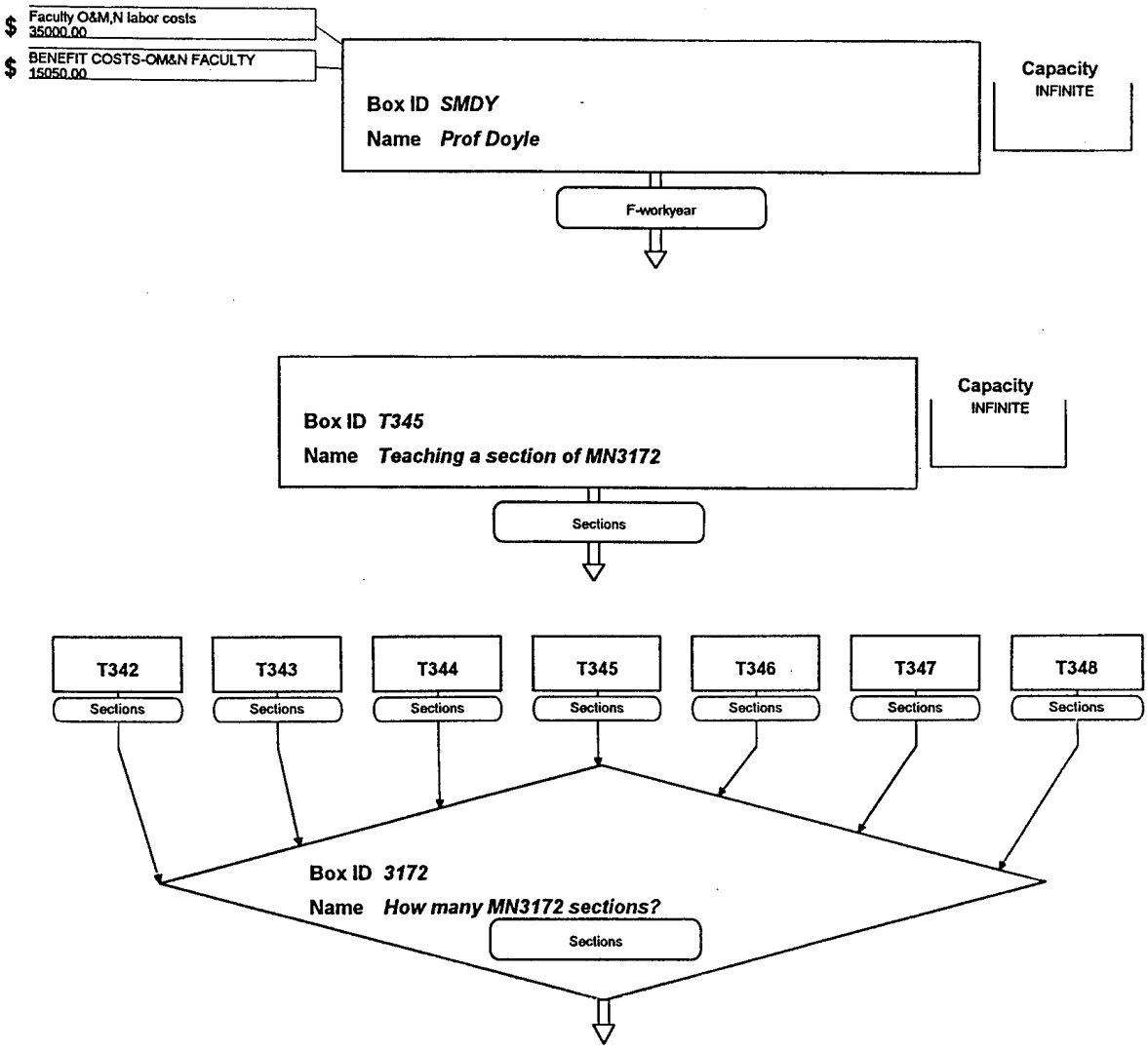
AOBStudent
Box ID 837
Name 837 Students
Volume : 69.00
AOBStudent


$ Faculty O&M,N labor costs
35000.00
$ BENEFIT COSTS-OM&N FACULTY
15050.00
Box ID SMDY
Name Prof Doyle
Capacity
INFINITE
F-workyear
Box ID T345
Name Teaching a section of MN3172
Capacity
INFINITE
Sections
T342
T343
T344
T345
T346
T347
T348
Sections
Box ID 3172
Name How many MN3172 sections?
Sections

APPENDIX B. COSTS DRAWN TO THE 837 CURRICULUM

This appendix provides a listing of all Systems Management Courses, the number of 837 Curriculum students enrolled in the course, and the associated costs drawn by the 837 Curriculum.

BOX IDENTI-FICATION	COURSE NUMBER	NUMBER OF 837 STUDENTS	NUMBER OF SECTIONS REQUIRED FOR 837	COST
2031	MN2031	30	1.760	$ 30,659
2039	MN2039	0	0	0
2111	MN2111	0	0	0
2112	MN2112	0	0	0
2150	MN2150	38	1.38	$ 14,364
2155	MN2155	0	0	0
2302	MN2302	4	.056	$ 524
2303	MN2303	0	0	0
3105	MN3105	42	1.766	$ 16,869
3111	MN3111	0	0	0
3140	MN3140	36	1.2	$ 7,679
3154	MN3154	34	.92	$ 6,540
3161	MN3161	41	1.41	$18,103
3172	MN3172	29	1.09	$10,190
3221	MN3221	1	.066	$ 524
3222	MN3222	0	0	0
3301	MN3301	45	1.73	$32,115
3303	MN3303	0	0	0
3304	MN3304	0	0	0
3305	MN3305	0	.124	$ 1,118
3306	MN3306	0	0	0
3307	MN3307	0	0	0
3309	MN3309	0	0	0
3311	MN3311	0	0	0
3312	MN3312	0	0	0
3333	MN3333	46	2.30	$28,124
3371	MN3371	0	0	0
3372	MN3372	2	.063	$ 1,020
3373	MN3373	0	0	0
3374	MN3374	3	.067	$ 784
3375	MN3375	0	0	0
3377	MN3377	0	0	0
3760	MN3760	0	0	0
3805	MN3805	22	1.1	$13,748

BOX IDENTI-FICATION	COURSE NUMBER	NUMBER OF 837 STUDENTS	NUMBER OF SECTIONS REQUIRED FOR 837	COST
3900	MN3900	0	0	0
3902	MN3902	0	0	0
4105	MN4105	40	1.429	$20,526
4106	MN4106	0	0	0
4110	MN4110	0	0	0
4111	MN4111	0	0	0
4112	MN4112	0	0	0
4114	MN4114	0	0	0
4115	MN4115	0	0	0
4119	MN4119	0	0	0
4125	MN4125	2	.060	$ 999
4145	MN4145	45	1.660	$15,914
4151	MN4151	41	1.875	$29,373
4152	MN4152	31	1.720	$48,370
4153	MN4153	24	1.548	$47,910
4159	MN4159	17	.94	$17,107
4161	MN4161	44	1.660	$29,070
4162	MN4162	45	1.525	$26,973
4163	MN4163	12	1.091	$8,185
4301	MN4301	0	0	0
4302	MN4302	0	0	0
4305	MN4305	11	.688	$ 6,360
4307	MN4307	0	0	0
4310	MN4310	0	0	0
4312	MN4312	0	0	0
4371	MN4371	1	.050	$ 329
4372	MN4372	0	0	0
4373	MN4373	0	0	0
4376	MN4376	0	0	0
4761	MN4761	0	0	0
4900	MN4900	1	.167	0
4970	MN4970	1	.120	0
A123	IS0123	28	1.79	$ 584
B000	IS2000	0	0	0

BOX IDENTI-FICATION	COURSE NUMBER	NUMBER OF 837 STUDENTS	NUMBER OF SECTIONS REQUIRED FOR 837	COST
C020	IS3020	0	0	0
C112	IS3112	0	0	0
C170	IS3170	0	0	0
C183	IS3183	29	1.148	$17,623
C502	IS3502	0	0	0
C503	IS3503	0	0	0
D182	IS4182	0	0	0
D183	IS4183	0	0	0
D185	IS4185	0	0	0
D200	IS4200	0	0	0
D300	IS4300	0	0	0
D320	IS4320	0	0	0
D502	IS4502	0	0	0
D800	IS4800	0	0	0
D990	IS4990	0	0	0

APPENDIX C. AVERAGE COST PER SECTION AND STUDENT

This appendix provides a listing of all Systems Management Courses, the number of sections per course, the average number of students enrolled in a section, the average cost per section and the average cost per student for each course.

BOX IDENTI-FICATION	COURSE NO.	NO. OF SECTIONS	AVERAGE NO. OF STUDENTS PER SECTION	AVERAGE COST PER SECTION	AVERAGE COST PER STUDENT
2031	MN2031	6	19	$17,419	$ 917
2039	MN2039	1	10	$ 8,007	$ 801
2111	MN2111	1	25	$33,165	$1,326
2112	MN2112	1	24	$ 6,751	$ 281
2150	MN2150	6	26	$10,408	$ 400
2155	MN2155	3	25	$13,580	$ 543
2302	MN2302	4	36	$ 6,947	$ 210
2303	MN2303	4	45	$ 7,043	$ 156
3105	MN3105	10	26	$10,739	$ 239
3111	MN3111	3	10	$11,644	$1,164
3140	MN3140	7	30	$ 6,400	$ 213
3154	MN3154	6	37	$ 7,125	$ 193
3161	MN3161	7	29	$12,839	$ 442
3172	MN3172	7	29	$ 9,348	$ 322
3221	MN3221	2	13	$ 7,853	$ 604
3222	MN3222	1	19	$ 5427	$ 286
3301	MN3301	10	26	$18,563	$ 714
3303	MN3303	2	15	$ 6,574	$ 438
3304	MN3304	2	12	$ 7,255	$ 605
3305	MN3305	2	8	$ 8,945	$1,118
3306	MN3306	1	17	$ 5,697	$ 335
3307	MN3307	3	18	$ 8,000	$ 444
3309	MN3309	2	31	$11,240	$ 363
3311	MN3311	2	22	$24,643	$1,112
3312	MN3312	2	13	$ 5,697	$ 438
3333	MN3333	10	20	$12,227	$ 611
3371	MN3371	4	27	$ 7,793	$ 289
3372	MN3372	3	32	$16,312	$ 510
3373	MN3373	1	17	$17,556	$1,033
3374	MN3374	1	45	$11,759	$ 261
3375	MN3375	2	16	$ 4,961	$ 310
3377	MN3377	2	10	$ 4,976	$ 310
3760	MN3760	1	25	$ 4,274	$ 171
3805	MN3805	2	20	$12,498	$ 625
3902	MN3902	1	24	$16,598	$ 692
4105	MN4105	7	28	$14,368	$ 513
4106	MN4106	1	23	$13,642	$ 593
4110	MN4110	1	25	$ 3,826	$ 153
4111	MN4111	1	25	$33,281	$1,331
4112	MN4112	1	16	$33,281	$2,080
4114	MN4114	1	10	$13,642	$1,364
4115	MN4115	1	26	$ 6,571	$ 260

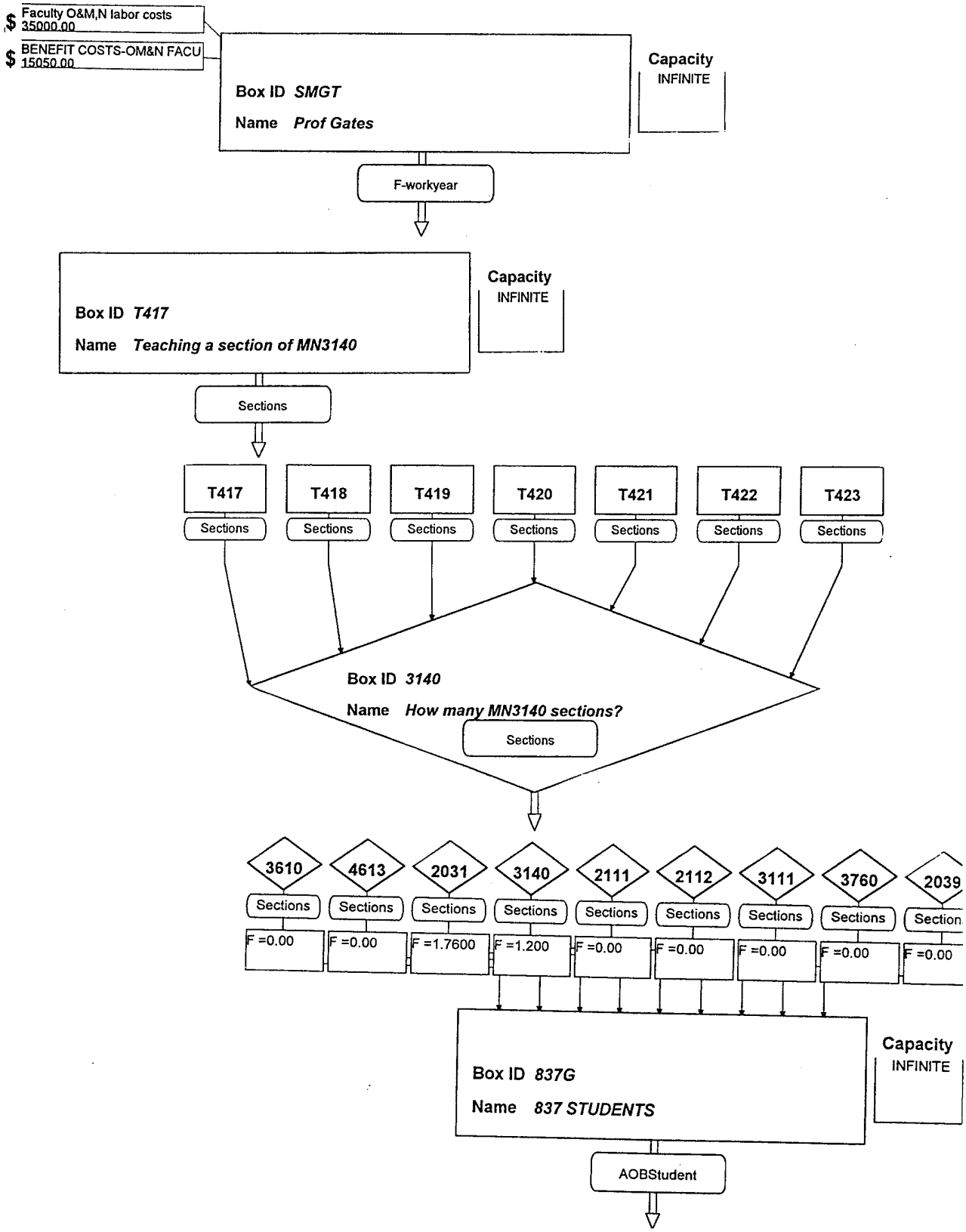
BOX IDENTI-FICATION	COURSE NO.	NO. OF SECTIONS	AVERAGE NO. OF STUDENTS PER SECTION	AVERAGE COST PER SECTION	AVERAGE COST PER STUDENT
4119	MN4119	1	52	$13,642	$ 262
4125	MN4125	3	29	$16,654	$ 574
4145	MN4145	7	27	$ 9,586	$ 355
4151	MN4151	2	21	$15,665	$ 746
4152	MN4152	2	18	$28,122	$1,562
4153	MN4153	2	19	$30,949	$1,628
4159	MN4159	1	18	$18,199	$1,011
4161	MN4161	2	27	$17,512	$ 649
4162	MN4162	2	30	$17,687	$ 590
4163	MN4163	2	11	$ 7,503	$ 682
4301	MN4301	2	16	$ 7,584	$ 474
4302	MN4302	0	0	0	0
4305	MN4305	2	17	$ 9,244	$ 544
4307	MN4307	2	49	$ 7,939	$ 162
4310	MN4310	3	24	$ 6,569	$ 274
4312	MN4312	2	9	$ 6,569	$ 730
4371	MN4371	2	20	$ 6,575	$ 329
4372	MN4372	0	0	0	0
4373	MN4373	1	15	$18,589	$1,239
4376	MN4376	1	29	$ 7,474	$ 258
4761	MN4761	1	25	$ 3,826	$ 153
4900	MN4900	1	6	0	0
4970	MN4970	1	9	0	0
3610	AS3610	3	27	$ 7,031	$ 260
4613	AS4613	2	17	$ 7,716	$ 454
A123	IS0123	20	12	$ 343	$ 29
B000	IS2000	9	9	$ 9,280	$1,031
C020	IS3020	3	26	$12,064	$ 464
C112	CM3112	3	23	$ 6,503	$ 282
C170	IS3170	4	31	$10,797	$ 348
C171	IS3171	3	27	$ 6,503	$ 241
C183	IS3183	7	26	$15,350	$ 590
C502	IS3502	4	23	$ 8,308	$ 361
C503	IS3503	1	9	$23,466	$2,607
D182	IS4182	4	8	$15,284	$1,906
D183	IS4183	3	26	$ 8,181	$ 329
D185	IS4185	3	28	$18,443	$ 659
D200	IS4200	3	26	$10,754	$ 414
D300	IS4300	3	29	$38,331	$1,322
D320	IS4320	1	16	$11,856	$ 741
D502	IS4502	4	27	$12,539	$ 464
D800	IS4800	2	32	0	0

APPENDIX D. UNIT COSTS OF SYSTEMS MANAGEMENT DEPARTMENT OUTPUTS

This appendix is a computer model generated listing of the outputs identified in the model, the number of units and the average unit cost of these outputs.

370	370 Students	185.00	AOBStudent	11436.0649
813	813 Students	8.00	AOBStudent	12822.9199
814	814 Students	15.00	AOBStudent	12024.6344
815	815 Students	45.00	AOBStudent	11470.9972
816	816 Students	63.00	AOBStudent	11226.5575
817	817 Students	28.00	AOBStudent	11954.7946
819	819 Students	8.00	AOBStudent	13952.4570
820	820 Students	25.00	AOBStudent	9987.6988
827	827 Students	50.00	AOBStudent	10694.2463
837	837 Students	69.00	AOBStudent	12359.3958
847	847 Students	46.00	AOBStudent	13077.3709
DAA	AERONAUTICAL ENGINEERING	52.00	AOBStudent	608.6130
DCCC	COMMAND, COMMUNICATIONS, CON	62.00	AOBStudent	508.3033
DEE	ELECTRONIC ENGINEERING	67.00	AOBStudent	512.0588
DME	MECHANCIAL ENGINEERING	10.00	AOBStudent	544.7909
DNSA	NATIONAL SECURITY AFFAIRS	14.00	AOBStudent	455.5057
DOA	OPERATIONS ANALYSIS STUDENTS	154.00	AOBStudent	316.0506
DSTA	NPS STAFF STUDENTS	21.00	AOBStudent	1520.4032
DUSS	UNDERWATER,SEA, SPACE	69.00	AOBStudent	580.6128
OTH	OTHER DEPTS ACTIVITIES/OVHD	1044.00	Project	2161.5620
RDAU	DEF ACQUISITION UNIVERSITY	1.00	Project	492895.0000
REME	EME PROGRAM (BUMED)	1.00	F-workyear	685634.8750
RES	SYSTEMS MGMT RESEARCH	37.00	Project	64683.0000
RSHT	SHORT COURSES	6.00	Project	10958.4831
THEA	ASSOCIATE THESES ADVISED	141.00	Theses	1712.8428
THEC	CO-ADVISOR THESES ADVISED	82.00	Theses	2569.2641
THEP	PRIMARY THESES ADVISED	151.00	Theses	3425.6856

APPENDIX E. FLOWCHART OF COSTS FOR MN3140 COURSE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$ BENEFIT COSTS-OM&N FACU 15050.00
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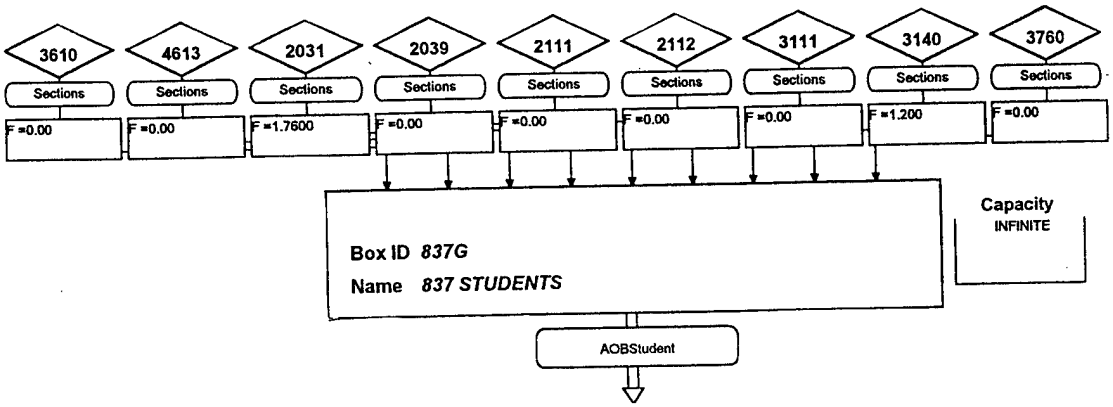
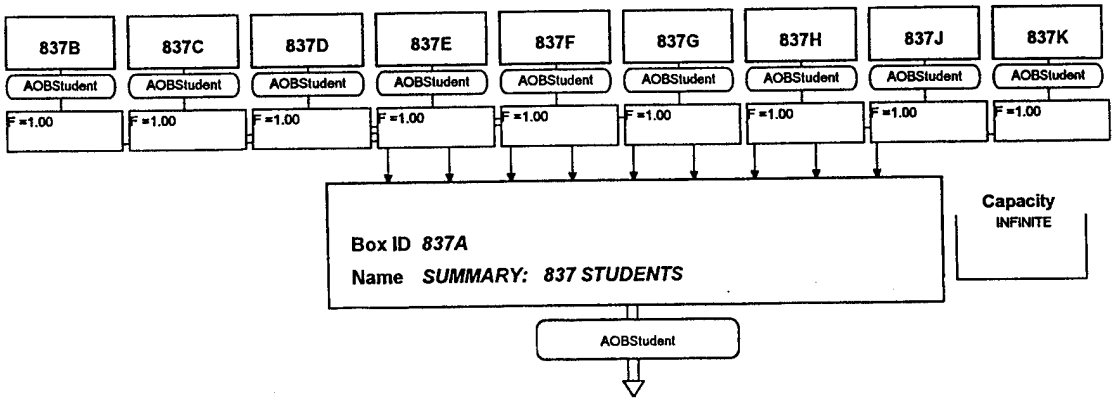
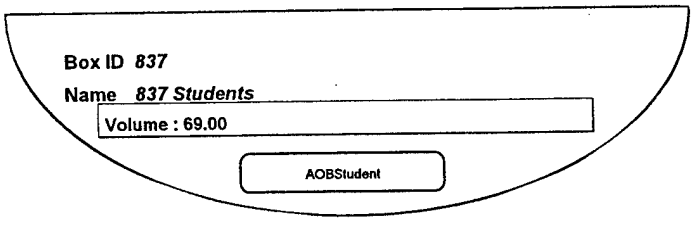
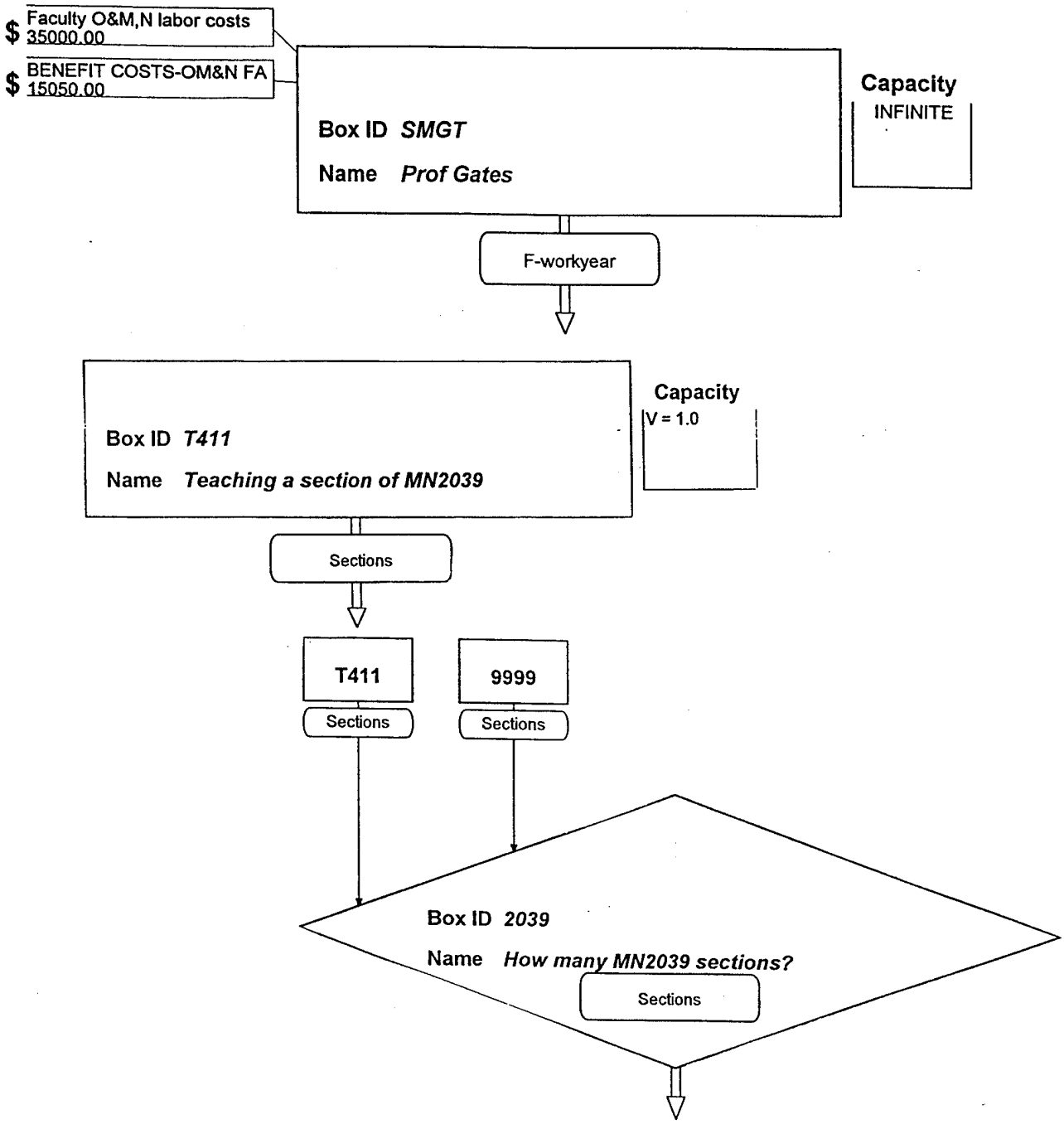
Name Prof Gates
Capacity
INFINITE
F-workyear
Box ID T417
Name Teaching a section of MN3140
Capacity
INFINITE
Sections
T417
T418
T419
T420
T421
T422
T423
Sections
Box ID 3140
Name How many MN3140 sections?
Sections
3610
4613
2031
3140
2111
2112
3111
3760
2039
Sections
F =0.00
F =0.00
F =1.7600
F =1.200
F =0.00
F =0.00
F =0.00
F =0.00
F =0.00
Box ID 837G
Name 837 STUDENTS
Capacity
INFINITE
AOBStudent

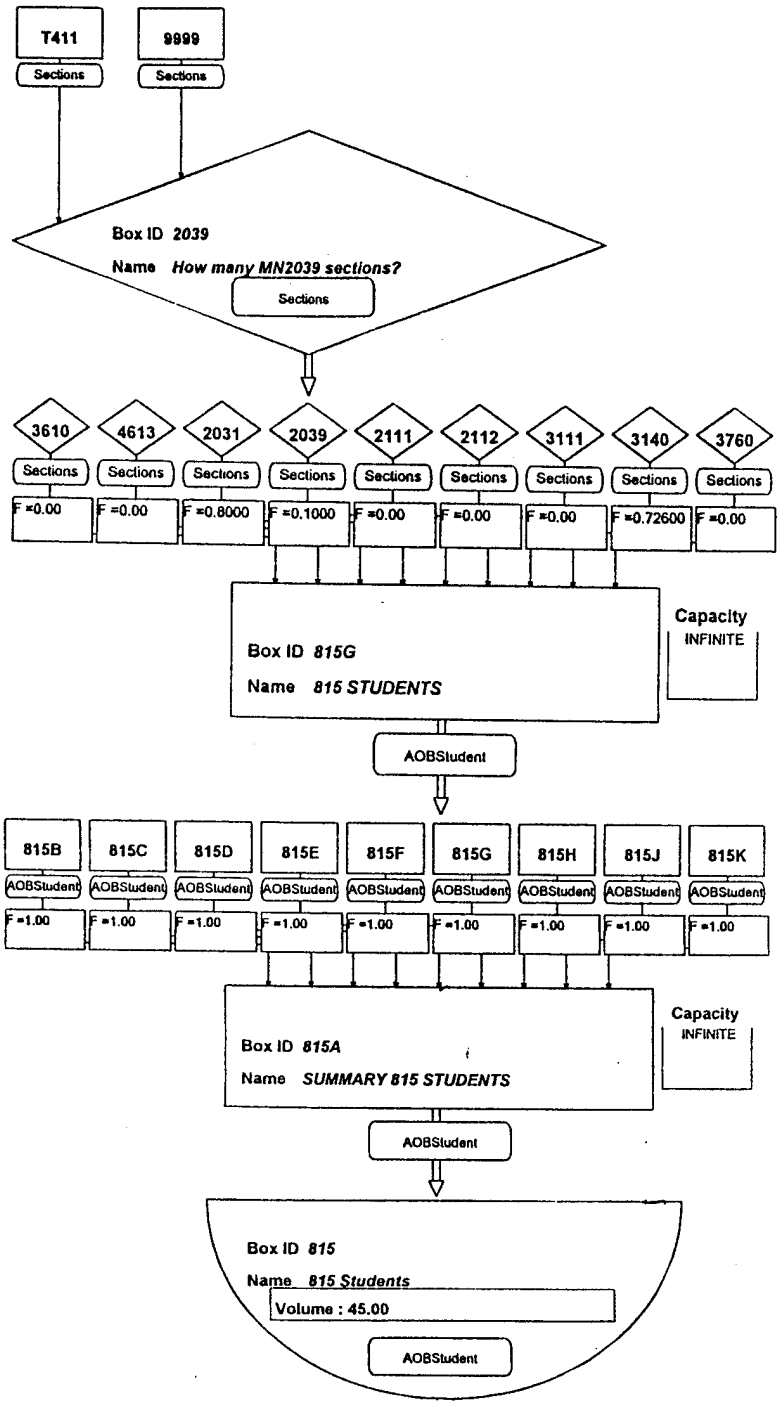

3610
4613
2031
2039
2111
2112
3111
3140
3760
Sections
F =0.00
F =0.00
F =1.7600
F =0.00
F =0.00
F =0.00
F =0.00
F =1.200
F =0.00
Box ID 837G
Name 837 STUDENTS
Capacity
INFINITE
AOBStudent

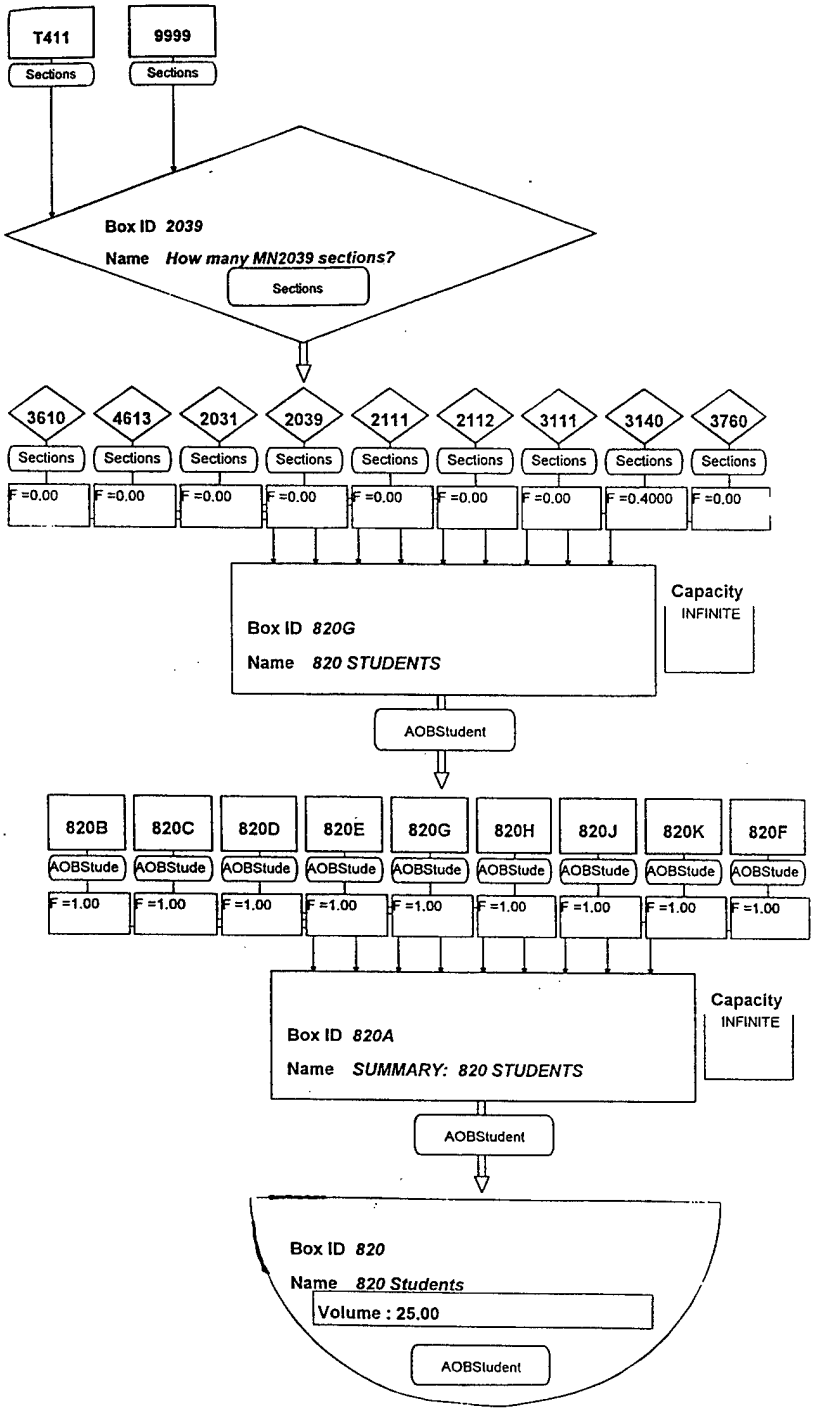

837B
837C
837D
837E
837F
837G
837H
837J
837K
AOBStudent
F =1.00
Box ID 837A
Name SUMMARY: 837 STUDENTS
Capacity
INFINITE
AOBStudent


Box ID 837
Name 837 Students
Volume : 69.00
AOBStudent

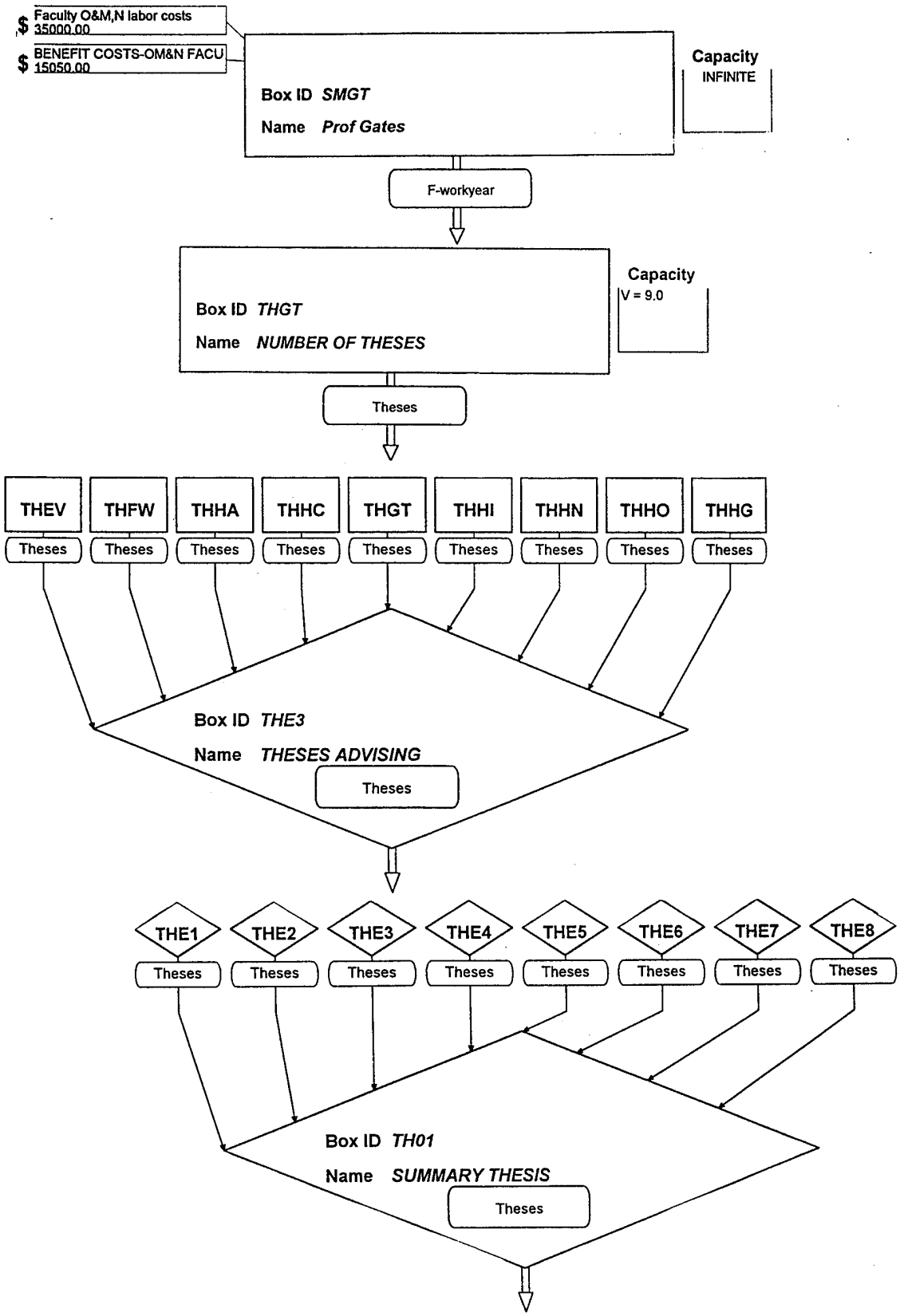
APPENDIX F. FLOWCHART OF COSTS FOR MN2039 COURSE

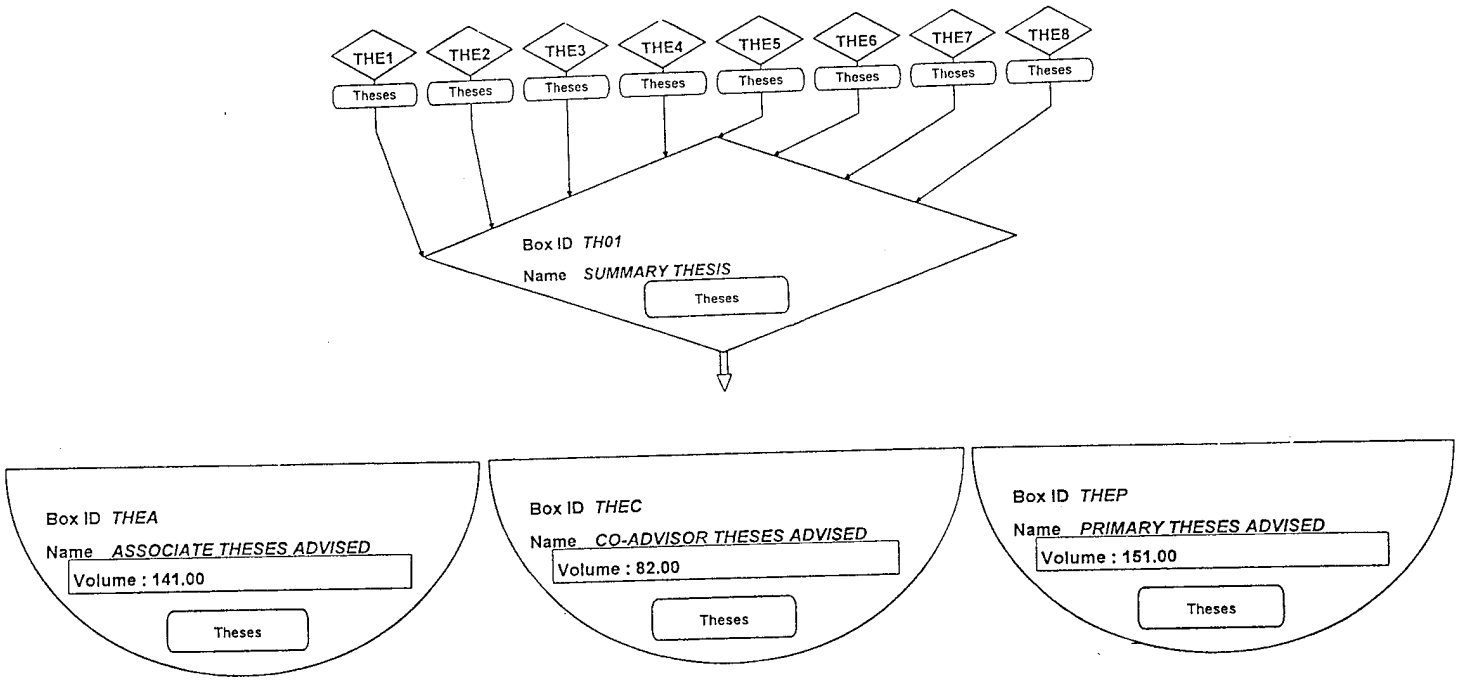

$ Faculty O&M,N labor costs
35000.00
$ BENEFIT COSTS-OM&N FA
15050.00
Box ID SMGT
Name Prof Gates
Capacity
INFINITE
F-workyear
Box ID T411
Name Teaching a section of MN2039
Capacity
V = 1.0
Sections
T411
Sections
9999
Sections
Box ID 2039
Name How many MN2039 sections?
Sections


T411
Sections
9999
Sections
Box ID 2039
Name How many MN2039 sections?
Sections
3610
4613
2031
2039
2111
2112
3111
3140
3760
Sections
F =0.00
F =0.00
F =0.8000
F =0.1000
F =0.00
F =0.00
F =0.00
F =0.72600
F =0.00
Box ID 815G
Name 815 STUDENTS
Capacity
INFINITE
AOBStudent
815B
815C
815D
815E
815F
815G
815H
815J
815K
AOBStudent
F =1.00
Box ID 815A
Name SUMMARY 815 STUDENTS
Capacity
INFINITE
AOBStudent
Box ID 815
Name 815 Students
Volume : 45.00
AOBStudent

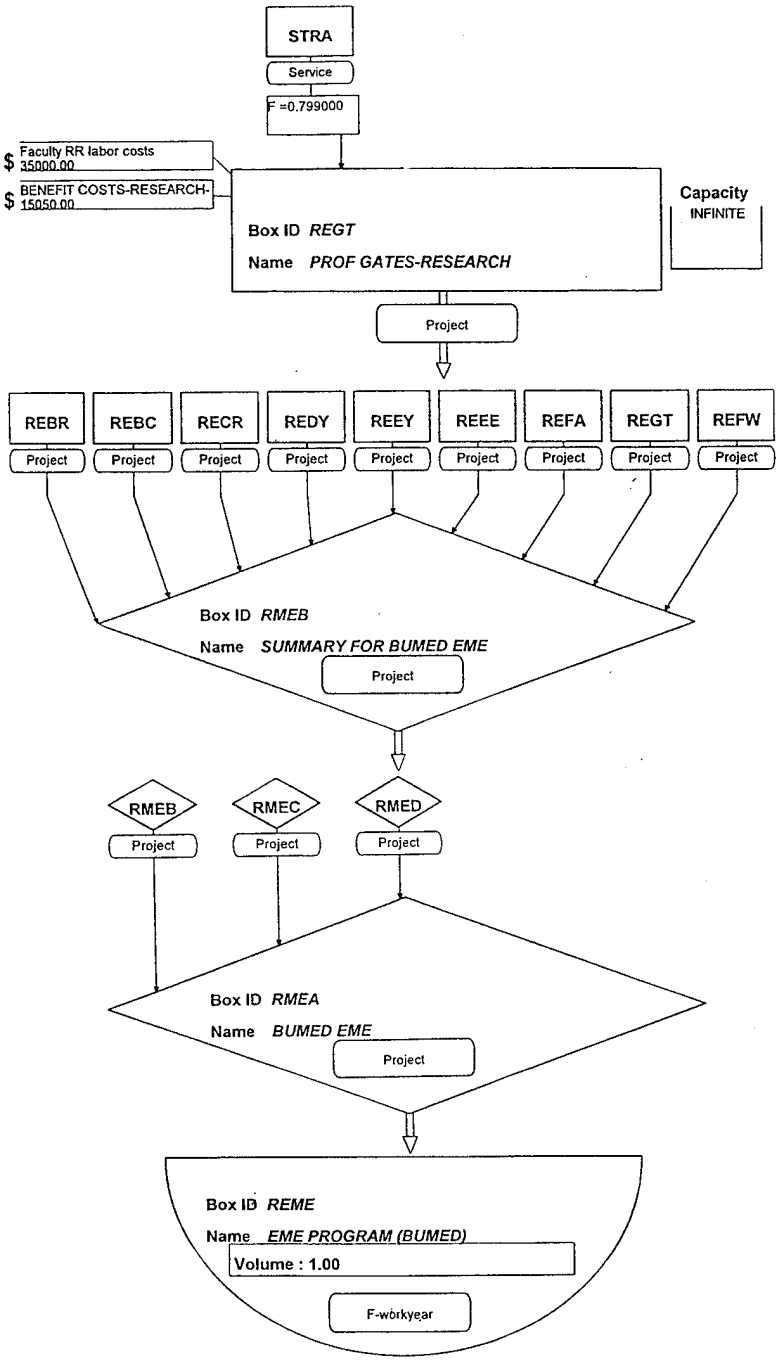

T411
Sections
9999
Sections
Box ID 2039
Name How many MN2039 sections?
Sections
3610
4613
2031
2039
2111
2112
3111
3140
3760
Sections
F =0.00
F =0.00
F =0.00
F =0.00
F =0.00
F =0.00
F =0.00
F =0.4000
F =0.00
Box ID 820G
Name 820 STUDENTS
Capacity
INFINITE
AOBStudent
820B
820C
820D
820E
820G
820H
820J
820K
820F
AOBStude
F =1.00
Box ID 820A
Name SUMMARY: 820 STUDENTS
Capacity
INFINITE
AOBStudent
Box ID 820
Name 820 Students
Volume : 25.00
AOBStudent

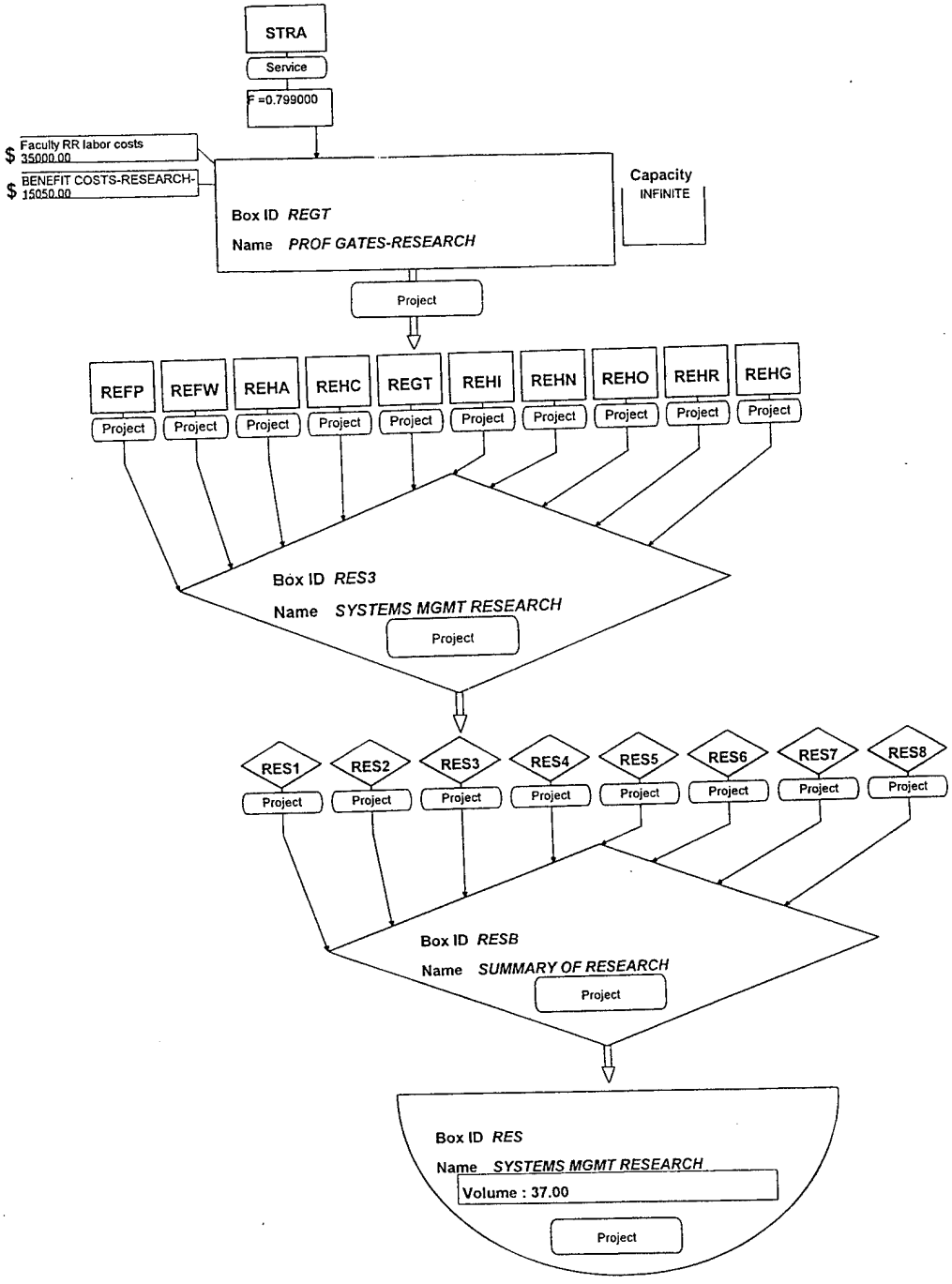
APPENDIX G. FLOWCHART OF COSTS FOR THESIS ADVISING


$ Faculty O&M,N labor costs
35000.00
$ BENEFIT COSTS-OM&N FACU
15050.00
Box ID SMGT
Name Prof Gates
Capacity
INFINITE
F-workyear
Box ID THGT
Name NUMBER OF THESES
Capacity
V = 9.0
Theses
THEV
THFW
THHA
THHC
THGT
THHI
THHN
THHO
THHG
Box ID THE3
Name THESES ADVISING
THE1
THE2
THE3
THE4
THE5
THE6
THE7
THE8
Box ID TH01
Name SUMMARY THESIS

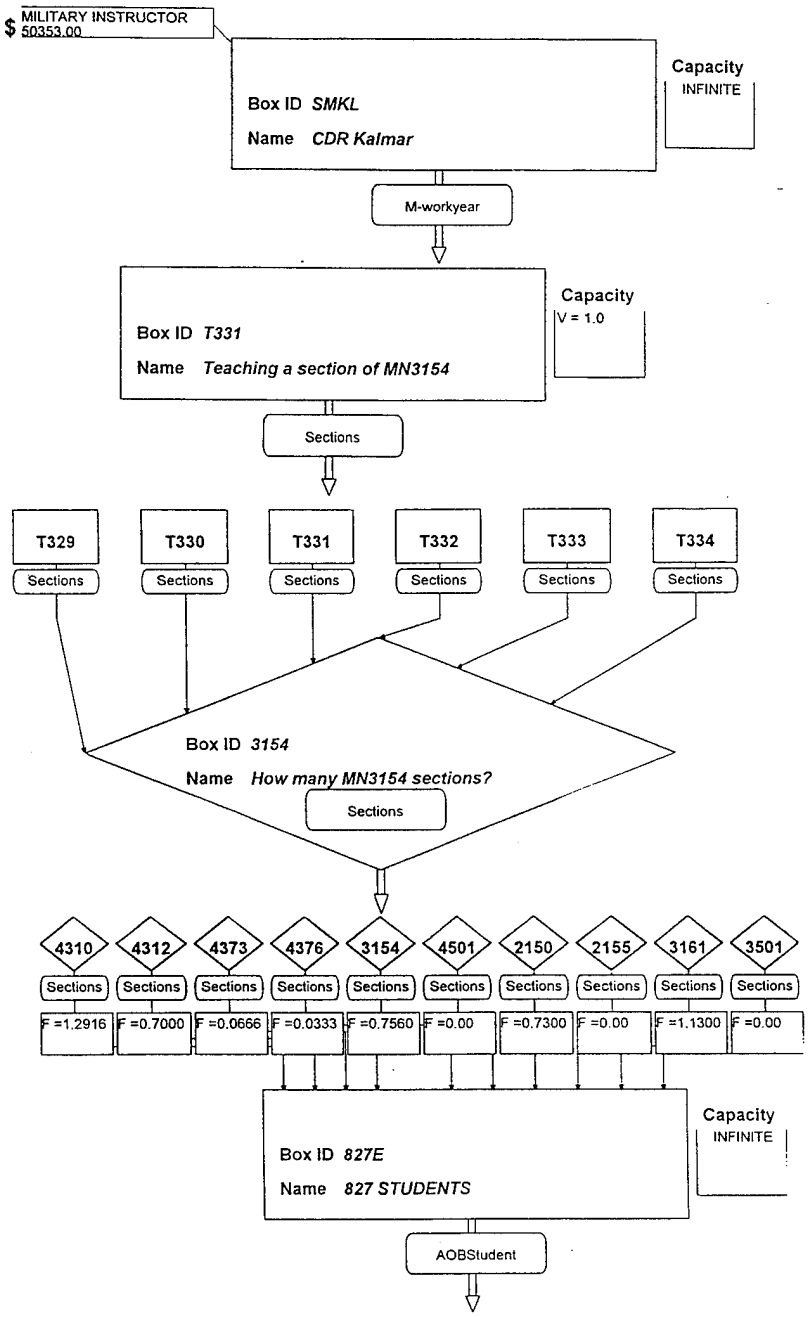

THE1
THE2
THE3
THE4
THE5
THE6
THE7
THE8
Theses
Box ID TH01
Name SUMMARY THESIS
Theses
Box ID THEA
Name ASSOCIATE THESES ADVISED
Volume : 141.00
Theses
Box ID THEC
Name CO-ADVISOR THESES ADVISED
Volume : 82.00
Theses
Box ID THEP
Name PRIMARY THESES ADVISED
Volume : 151.00
Theses

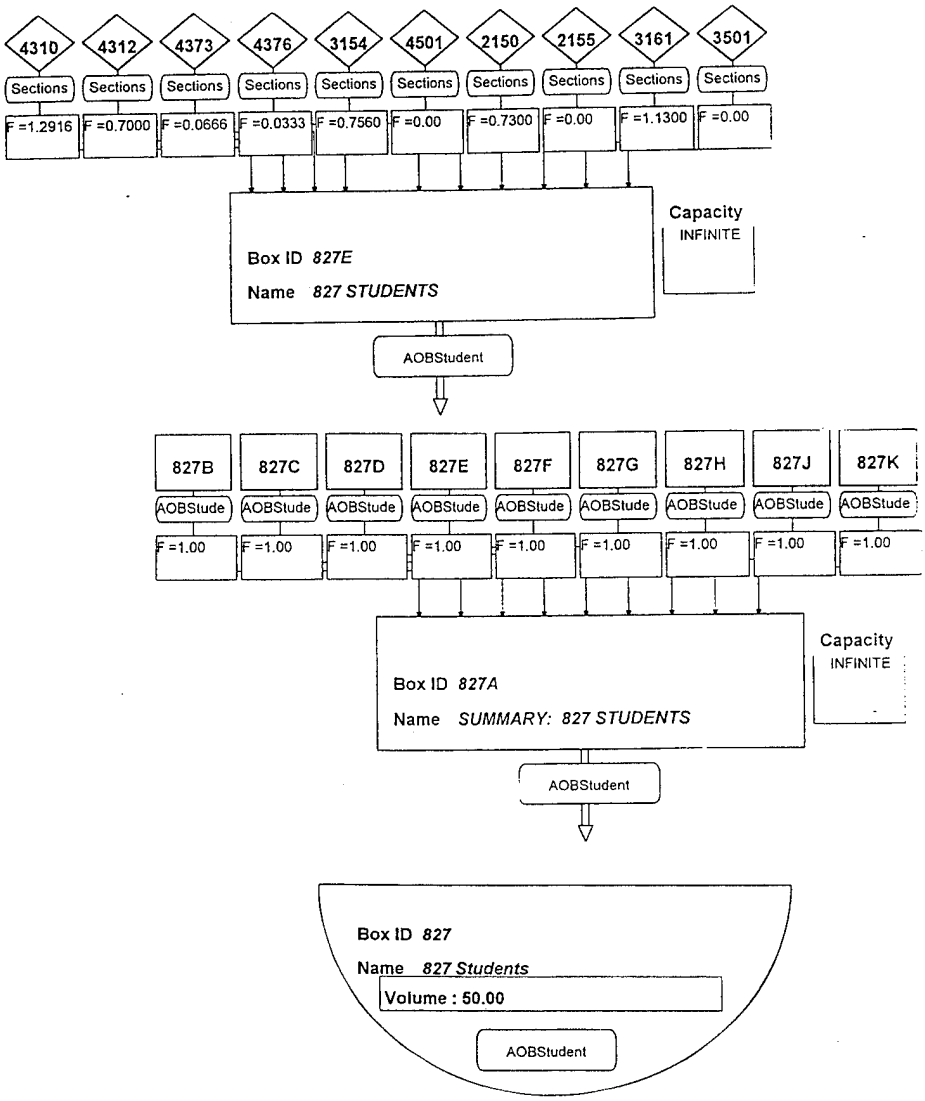
APPENDIX H. FLOWCHART OF COSTS FOR REIMBURSABLE ACTIVITIES

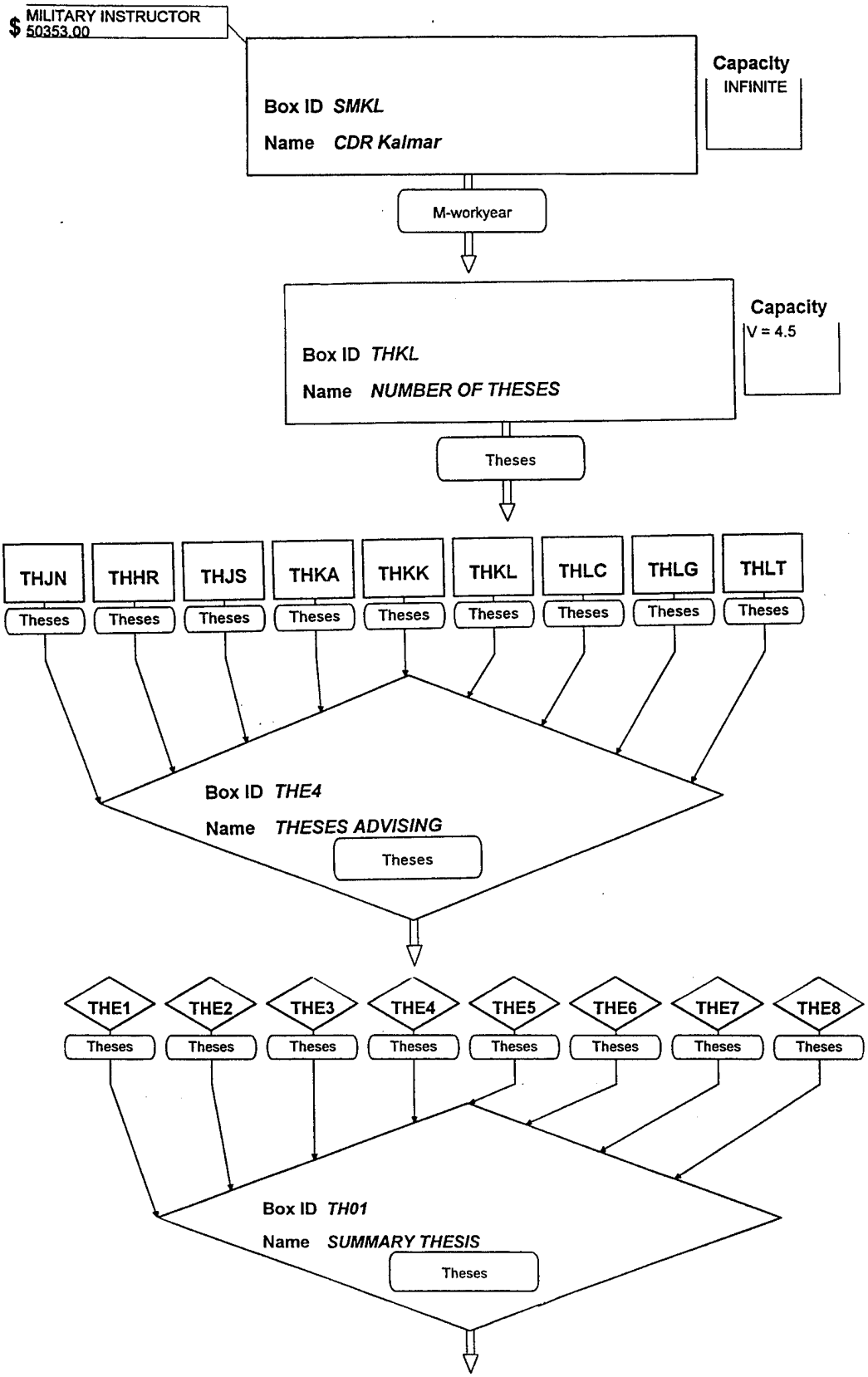

STRA
Service
F =0.799000
$ Faculty RR labor costs 35000.00
$ BENEFIT COSTS-RESEARCH- 15050.00
Box ID REGT
Name PROF GATES-RESEARCH
Capacity
INFINITE
Project
REBR
REBC
RECR
REDY
REEY
REEE
REFA
REGT
REFW
Project
Box ID RMEB
Name SUMMARY FOR BUMED EME
Project
RMEB
RMEC
RMED
Project
Box ID RMEA
Name BUMED EME
Project
Box ID REME
Name EME PROGRAM (BUMED)
Volume : 1.00
F-workyear

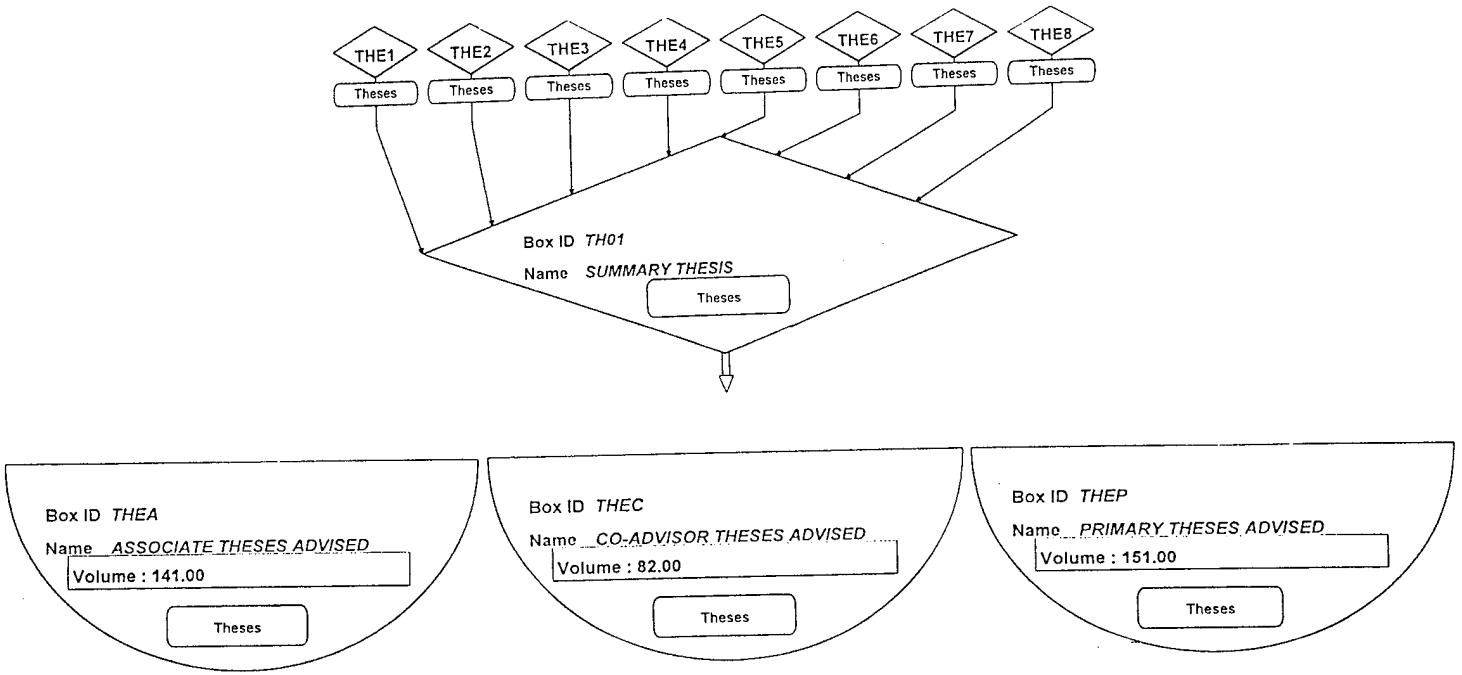

STRA
Service
F =0.799000
$ Faculty RR labor costs 35000.00
$ BENEFIT COSTS-RESEARCH- 15050.00
Capacity
INFINITE
Box ID REGT
Name PROF GATES-RESEARCH
Project
REFP
REFW
REHA
REHC
REGT
REHI
REHN
REHO
REHR
REHG
Project
Box ID RES3
Name SYSTEMS MGMT RESEARCH
Project
RES1
RES2
RES3
RES4
RES5
RES6
RES7
RES8
Project
Box ID RESB
Name SUMMARY OF RESEARCH
Project
Box ID RES
Name SYSTEMS MGMT RESEARCH
Volume : 37.00
Project

APPENDIX I. FLOWCHART OF MN3154 AND THESIS ADVISING


$ MILITARY INSTRUCTOR 50353.00
Box ID SMKL
Name CDR Kalmar
Capacity INFINITE
M-workyear
Box ID T331
Name Teaching a section of MN3154
Capacity V = 1.0
Sections
T329
T330
T331
T332
T333
T334
Box ID 3154
Name How many MN3154 sections?
4310
4312
4373
4376
3154
4501
2150
2155
3161
3501
F =1.2916
F =0.7000
F =0.0666
F =0.0333
F =0.7560
F =0.00
F =0.7300
F =0.00
F =1.1300
F =0.00
Box ID 827E
Name 827 STUDENTS
Capacity INFINITE
AOBStudent


4310
4312
4373
4376
3154
4501
2150
2155
3161
3501
Sections
F =1.2916
F =0.7000
F =0.0666
F =0.0333
F =0.7560
F =0.00
F =0.7300
F =0.00
F =1.1300
F =0.00
Box ID 827E
Name 827 STUDENTS
Capacity
INFINITE
AOBStudent
827B
827C
827D
827E
827F
827G
827H
827J
827K
AOBStude
F =1.00
Box ID 827A
Name SUMMARY: 827 STUDENTS
Capacity
INFINITE
AOBStudent
Box ID 827
Name 827 Students
Volume : 50.00
AOBStudent


$ MILITARY INSTRUCTOR 50353.00
Box ID SMKL
Name CDR Kalmar
Capacity
INFINITE
M-workyear
Box ID THKL
Name NUMBER OF THESES
Capacity
V = 4.5
Theses
THJN
THHR
THJS
THKA
THKK
THKL
THLC
THLG
THLT
Box ID THE4
Name THESES ADVISING
THE1
THE2
THE3
THE4
THE5
THE6
THE7
THE8
Box ID TH01
Name SUMMARY THESIS


THE1
THE2
THE3
THE4
THE5
THE6
THE7
THE8
Theses
Box ID TH01
Name SUMMARY THESIS
Theses
Box ID THEA
Name ASSOCIATE THESES ADVISED
Volume : 141.00
Theses
Box ID THEC
Name CO-ADVISOR THESES ADVISED
Volume : 82.00
Theses
Box ID THEP
Name PRIMARY THESES ADVISED
Volume : 151.00
Theses

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